AUGUST, 1944

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TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

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Spiral

THAT PREVENTS CHIP CLOGGING DURING

REAMING OPERATIONS

Putnam Hi-Speed Spiral Fluted Chucking Reamers are fast-cutting tools that never fail to leave a smooth, accurate hole.

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Putnam Hi-Speed Spiral Fluted Chucking Reamers are stocked in a wide range of sizes and with straight or taper shanks. Special diameters are also available . . . all can be delivered promptly.

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CONTINUOUS PILOT COUNTERBORES
SPIRAL FLUTED CHUCKING REAMERS

ARMY E NAVY

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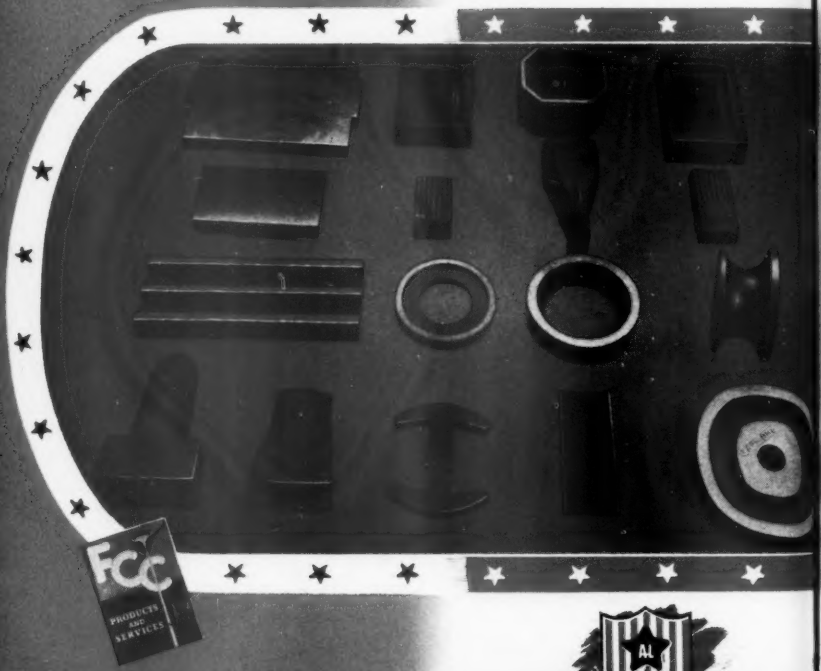

WRITE FOR THIS BOOKLET

It contains details of FCC Tool Steels Cast To Shape and of other important Forging and Casting Division specialties that may offer you money-saving production ideas. Get your copy—write for it today.

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1" collet capacity, 9" swing, 16" center distance, sixteen spindle speeds from 27 to 1750 r.p.m.

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High Speed Precision
TOOL ROOM LATHE

When tool room collet work with one inch diameter or less is done on heavy lathes designed to produce large work, here is what happens—time is lost, machines lose power by under-capacity production, excess power is consumed for the work involved and floor space is wasted.

For profits proportionate to machine investment, use the proper size tool room lathe comparable to the work involved.

To have complete information on a precision machine designed for speedy turning, boring and threading, obtain a copy of our bulletin illustrating and describing the above unit.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

THE TOOL & DIE JOURNAL

GEORGE J. HUEBNER • EDITOR, PUBLISHER

Technical Editor, E. WILLARD PENNINGTON **Assistant Editor, PAUL L. REED**

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The Tool & Die Journal is published monthly for those industry key men who are responsible for designing, building and using precision tooling

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Assembly time reduced!

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FACTS YOU SHOULD KNOW
about
HARD *Chromium Plating*

Chromium electroplating was first accomplished by Bunson in 1854, while Geuther in 1856 succeeded in electroplating with chromium from a chromic acid solution which is the method in general use today.

Until 1935 chromium plate was principally used as a decorative coating. This coating was very thin (.00002") and was used on many articles because it retained its lustrous beauty by resisting tarnish.

Not until we entered the war did "*hard*" chromium plating become an important factor in the tool industry, for it was quickly discovered that coatings from .0002" to .05" thick would conserve steel by greatly increasing the life of hand and machine tools and make fabricated parts last longer.

Most industrial coatings of chromium plate were found to have a value of 1000 Brinell with No. 9 position on the Mohs scale, with the diamond as No. 10. This extreme hardness was found to outlast the wearing qualities of hardened steel gages by 5 times.

That is why all Ellstrom made gage blocks are chromium plated on their gaging surfaces—to give them wearing qualities that will outlast the life of the ordinary hard steel blocks.

By actual test Ellstrom standards will last 2 to 5 times longer.

★ This is number one in a series of articles by the Dearborn Gage Company on chromium plating. ★

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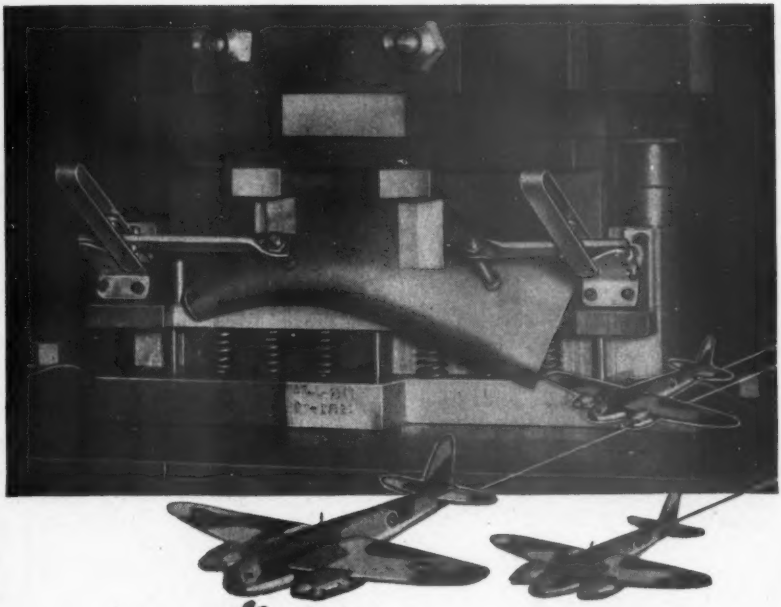
Originators of Chromium Plated Gage Blocks



Target Berlin

Danly Die Set

Die Springs	Stripper Bolts
Dowel Pins	Goose Neck Clamps
Kwik Klamps	Knurled Cap Screws

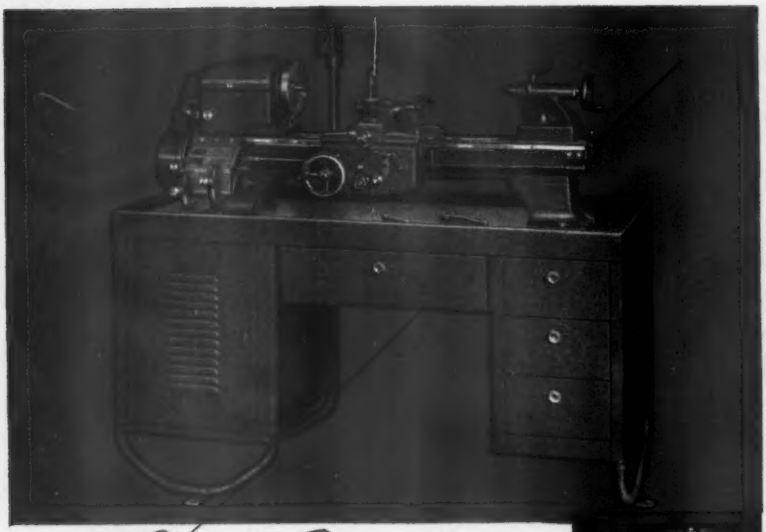
Are all in this picture, Target Berlin!

The famous British "Mosquito" bomber, that keeps Berlin awake on "quiet" nights, carries many parts made in Danly Die Sets.

Shown above is one of 8 dies that form and trim the exhaust pipes of this World's Fastest Bomber. Also shown is an interesting example of Danly Die Makers' Supplies, assembled with the die in a Danly Die Set. Easy for the die maker, tough on the Axis.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue *Chicago 50, Illinois*

Danly Die Sets - Die Makers' Supplies



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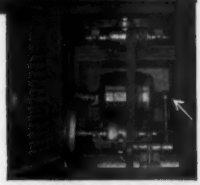
NEW QUICK CHANGE GEAR CABINET LATHE

With Automatic Apron

The Logan Cabinet Lathe is adaptable to tool room work, for maintenance, training, or production. It is built for durability to standards of precision outstanding in its field. The carriage with friction-feed automatic apron travels over a rugged bed ground to within .0005" of absolute accuracy. Total run-out of headstock spindle 12 inches from the bearing is less than .001". Lead screw is held to within .002" in 12 inches. Precision preloaded ball bearing headstock and self lubricating bronze bearings at 40 vital points minimize friction. Strong steel cabinet has four drawers. Left hand compartment contains underneath motor drive and countershaft. 3-point base makes it steady on any floor. All moving belts and gears enclosed. Write for catalog information.



UNDERNEATH DRIVE: Completely self contained and enclosed in left compartment of cabinet. For easy, safe belt changing, the lever (indicated by white arrow) is pulled outward to release flat belt tension. Adjustments of both flat belt and V-belt tensions are easy to reach. Multiple V-Belt Drive transmits power from cone pulley to spindle.

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Logan

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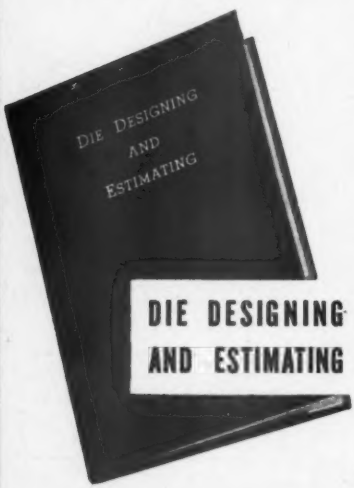

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Lempco Model ACX Grinder

Work Spindle Speeds	80-130 RPM
Carriage Feed	.020"
Swing	18"
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Face Grinding	18"
Internal Grinding, Diameters up to	18"
Internal Grinding, Length	8"
External Grinding	8"
Turning Range:	
Maximum inside diameter	1 - 18"
Maximum outside diameter	18"
Face Plate Diameter	18"
Carriage Travel	16"
Cross-Slide Travel	9"
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Hollow work spindle with draw-bar provides fast and easy method of mounting work. Change-over from turn to grind or vice verse, can be made in just a few moments. Adjustable work head.

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(Patent Applied For)

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SHEAR-CUT
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NUCUT TWO-FILE FILING HELPS STEP UP WAR PRODUCTION

A NUCUT File is virtually TWO-files-in-ONE. Its coarse teeth cut deep, clean, true. Its fine teeth level off the surface smooth. Both filing actions take place at the same stroke — without any scraping or skidding.

Both the coarse teeth and the fine teeth are scientifically positioned in patented "Wavy Teeth" rows that enable a NUCUT File to do more work faster, easier, with less effort. Try a NUCUT File on your next job,—and you can prove this to your own satisfaction!

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America's Oldest File Manufacturers — Good Tools Since 1836
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PAT. NO. 2027039

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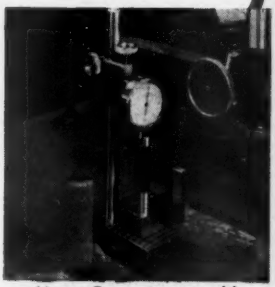
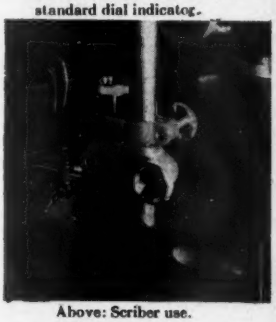
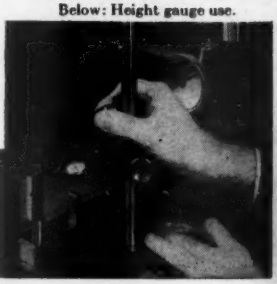


Above: Comparator use with standard dial indicator.



Above: Scriber use.

Below: Height gauge use.



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This gauge can be used for fine settings due to the differential screw adjustment. Measurement in the tenths of thousandths is quickly and accurately attained.

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Made in three column lengths — 10″ — 14″ — 18″

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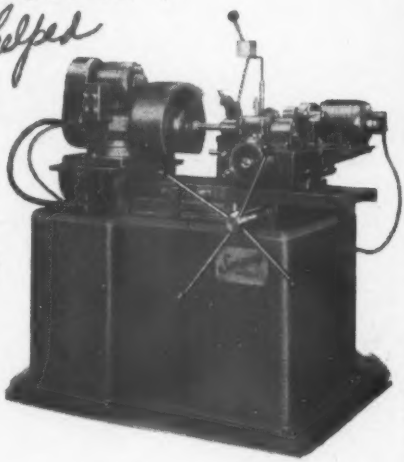

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PLUG GAGES • MICROMETER CHECKERS • PRECISION AIRCRAFT, AUTOMOTIVE, AND ORDNANCE PARTS

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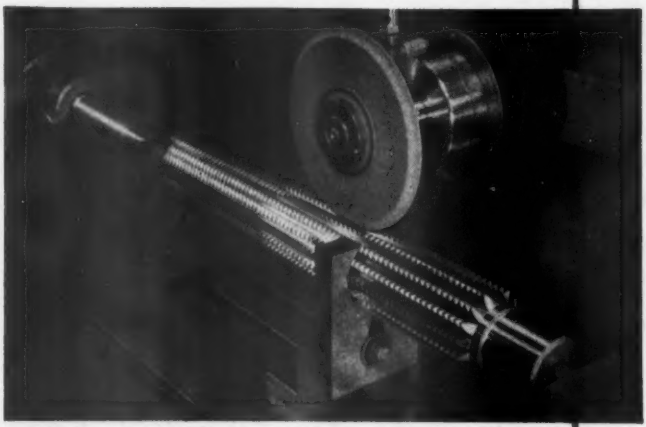

and manufacture

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If you are considering a broaching program in your plant, the U. S. Broach Company invites you to consult with their engineers before starting an important program of this type.

The reason for this is apparent, for in setting up a broaching department costly production delays can be avoided if the proper broach is selected for each broaching operation.

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3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
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**Includes Hearth Plate*

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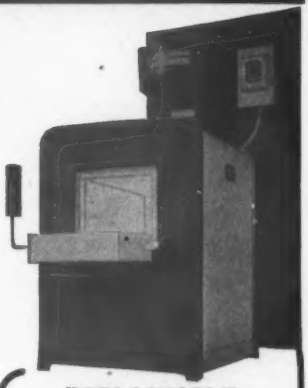
AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



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per piece milled

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A broaching machine, originally used to cut a wrench slot in a bearing, turned out 3,000 pieces every twenty-four hours. Placed on the Nichols Miller with a specially designed fixture, production was immediately increased to 9,000.

A turret lathe produced 100 units per day of a part requiring a hole-diameter tolerance of ± .0005"; the Nichols Miller upped this to 300!

On production lines everywhere, this versatile machine performs dozens of high-speed machining operations under the same roof—often doing the work of precision boring machines, lathes and grinders...to tolerances in "tenths."

The Nichols Miller is no ordinary hand miller. Starting with the principle of bringing the cutter on a sliding head down to the work, W. H. Nichols & Sons has engineered around it a machine tool that permits countless precision operations heretofore considered only within the scope of heavier, costlier millers.

How industry uses the Nichols Miller is illustrated in an 86-page handbook of unusual applications. Write for it today.

WORKING SURFACE: 6¾" x 21", or 6¾" x 30". RANGE: Longitudinal, 10" or 19"; Transverse, 7"; Vertical-Knee, 13"; Spindle Rise and Fall, 4½". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

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"The Miller That Uses Its Head"

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This is an exploded view of a VARD precision thread gage. This gage can explode your inspection costs if you are still checking external threads with a pair of ring gages.

In one quick operation, threaded work on the bench or in the machine can be gaged for lead, thread form, pitch diameter, straightness and roundness.

Correctly cut threads pass through the GO rolls—are stopped by the NO GO rolls.

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CHECK EITHER RIGHT OR LEFT HAND THREADS WITH THE SAME GAGE.

- Rotating rolls reduce wear.
- Eccentric pins permit adjustment.
- Meehanite, hand fitting frame.
- Open end gage frame permits checking threads to a shoulder.
- Lock nuts secure gage setting.

VARD JOHN-SONS ROLL THREAD SNAP GAGES ARE MADE IN SIZES TO GAGE WORK FROM NO. 0 TO 12-IN. DIAMETER, AND IN ALL STANDARD THREAD FORMS.

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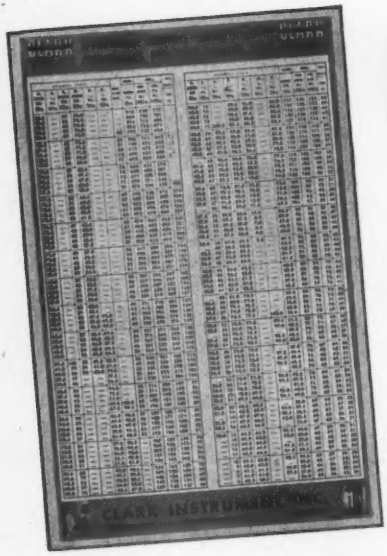

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By simply raising the locking ring, the centrifugal force throws two balls out of position, permitting the collet to drop out automatically.

Collets of various types can be furnished to accommodate Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps and Special Tools.

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"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on Request.)

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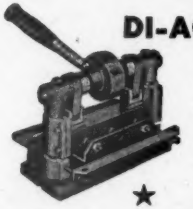

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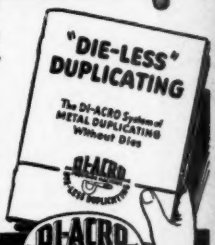
Squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. 3 sizes. Shearing widths, 6", 9", 12".

DI-ACRO Brake

Forms non-stock angles, channels or "Vees". Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".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The DI-ACRO System of METAL DUPLICATING Without Dies
DI-ACRO
DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

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showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING".

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CYLINDRICAL Interrupter Cam for Gun-Fire Control

A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

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Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

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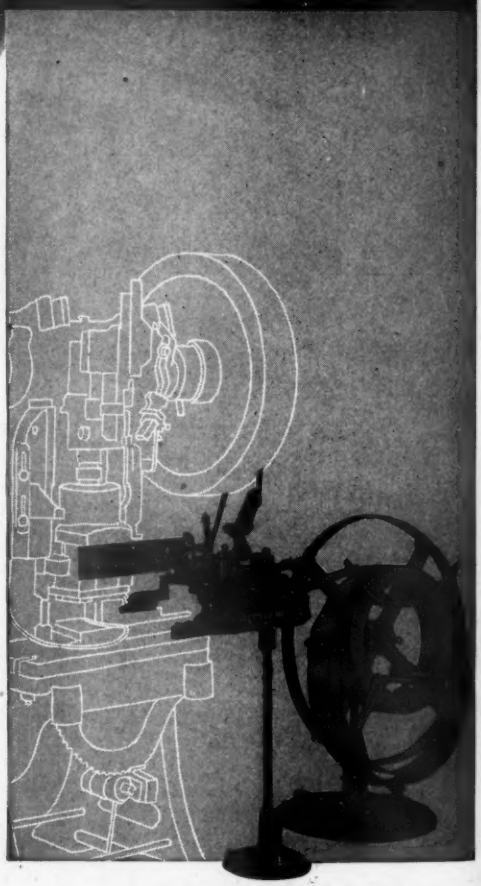

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ROLL FEEDS and REEL STANDS

For All Makes and Sizes of Punch Presses

ZOOM PRODUCTION!
SLASH COSTS!

with "Airgrip" Double-Action Devices

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YOUR judgment will be doubly vindicated when you invest in "Airgrip" Chucks — (1) *Immediately*, because your output records will rise — 25% and more — and your manpower problem will be eased; (2) *Later On*, because the unit-cost-cutting achieved with these improved, lathe-modernizing chucks will enable you to meet returning competition.

"Airgrip" Chucks offer "two-fisted" double gripping power because of the cam's wedge action (which operates in both directions) and locks the jaws *mechanically*, whether gripping internally or externally.

Work is held tight even if air supply is cut off completely.

Both the two-jaw and three-jaw "Airgrip" Universal Chucks permit using heavier cuts and coarser feeds to the very limit of the machine's power and cutting-tool endurance.

"AIRGRIP" REVOLVING AIR CYLINDERS

Double-acting ball-bearing, high-speed revolving air cylinder with maximum life and minimum maintenance. No manual adjustments required. Wear automatically taken up by air pressure within the cylinder.

HI-PO SUPERCHARGED HYDRAULIC PRESSURE PUMPS

3000 lb.-Pressure Pump, driven by a ½ h. p. motor! *Double-Pressure Production;* consists of a low-pressure section which *supercharges a high-pressure section.* Builds up pressure fast, with minimum pulsation.

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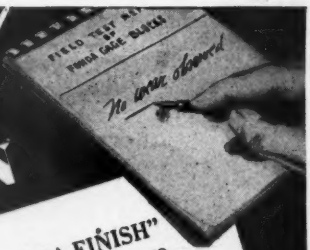

FONDA Gage Blocks with their "ULTRA-FINISH" not only achieve the highest-known standards in gage block accuracy, but their *precision-life* also is prolonged, unchanged, over the longest period of service.

Just how did it happen that, at the end of an extensive field test of FONDA gage blocks, "no wear observed" appeared in every report?

(A) The "ULTRA-FINISH" is a FONDA-developed processing of the gaging surfaces of gage blocks which results in *no peaks* to wear off and reduce the gage block size and accuracy.

(B) The selected steel, hardened and stabilized by other FONDA special processes, further contributes to the extraordinary wear-resistance of the "ULTRA-FINISH" surfaces.

Yet you pay no extra premium for this longer precision-life of FONDA gage blocks and the assurance it brings of a more perfect control of your fine-precision measurements.

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FONDA *Gage Blocks*

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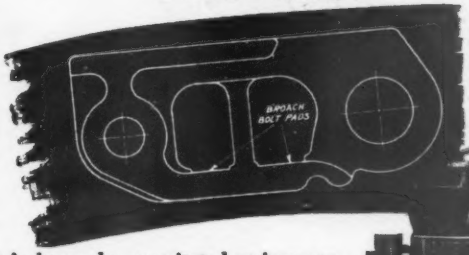
PASSED HIGHEST TESTS DEVISED BY THE NATIONAL BUREAU OF STANDARDS

BROACHING BY PROVEN

on Tanks Today . . . Ready for Tractors TOMORROW



War's demands necessitated an increase in the speed of precision production. Broaching met the challenge successfully. Forward-looking manufacturers will plan to cut costs, use manpower efficiently in peacetime by broaching—the *American* way.

Here is a typical example: Increased output, uniform accuracy, and excellent finish are obtained by broaching the internal bolt pads in tank track connector links. An *American* T-15-36 3-way type machine, provided with a manual positioning device to prevent loading a part of the wrong hand, does the work quickly, economically.

Let *American's* complete broaching service—machines, tools, and engineering—help you in war production or in postwar planning. Phone, wire, or write for complete information.

Enlist the services of an expert broach manufacturer when broaching tools are to be designed. Obtain the benefit of his experience.

DRILL JIG BUSHINGS? Here's a handy source of information. EX-CELL-O's two-color bulletin designed to save you time and trouble in selecting your bushing requirements. It's packed with practical data for purchaser and designer. It's printed on extra-heavy stock to give long, useful service. Send for your free copy today. Ask for EX-CELL-O Bulletin 11882-A.

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Precision MACHINE TOOLS • CUTTING TOOLS • AIRCRAFT AND MISCELLANEOUS PARTS

STOP DUST WITH DUSTKOPS

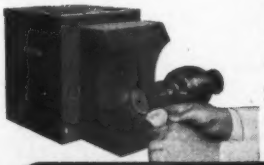
CUT-IN DUSTKOPS DURING A "CUT-BACK"

When only a few grinders are in operation, shut down the centralized dust collecting system and save enough power costs to pay for the Dustkops.

Dustkops are unit type dust collectors —highly portable, easily installed (usually without tools), quickly obtained —will solve the "interim dust collecting problem" during a change-over.

The bigger your plant, the quicker Dustkops will pay for themselves.

Don't remove the main duct; install a DUSTKOP *around-the-corner*. The compact Dustkop can be moved when the grinder is shut down.



Here's how to support the flexible metal hose that connects the wheelhood to Model 950 Dustkop for a Surface Grinder.

Laboratory Model PS-1 DUSTKOP will stop dust, lint, and filings. A removable tray is for sludge from wet grinding.

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Constant Rim speed...

DURING ENTIRE WHEEL LIFE!

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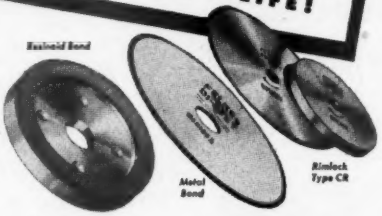
DIAMOND WHEELS

DI-MET Diamond Wheels give you fast cutting, efficient service on all grinding and cutting-off operations where use of diamond wheels are practical* because rim speeds show negligible change during entire wheel life . . . grinders with fixed spindle speeds, therefore, maintain their full efficiency from the time the wheel goes on the machine until its long, useful life is ended.

This slow-wearing rim has other advantages too—it makes precision easier to maintain from end to end on cylindrical or surface grinding, it simplifies obtaining uniform dimensions on multiple-toothed cutters without time wasted for individually indicating cutter teeth or for making constant machine infeed adjustments to compensate for wheel wear.

DI-MET Diamond Wheels lower down time for tool maintenance, cut fast and free, will not craze fragile carbide surfaces, produce much keener cutting edges than ordinary abrasives. Our catalog shows prices and sizes of all standard DI-MET wheel types—write for your free copy without delay!

FELKER MANUFACTURING CO.
1111 BORDER AVENUE, TORRANCE, CALIFORNIA



* **DI-MET DIAMOND WHEELS ARE MADE IN 3 BONDS:**

RESINOID BOND—for rapid grinding and cutting-off on all types of sintered carbides.

METAL BOND—for grinding all types of sintered carbides and non-metallic materials with exceptionally long wheel life and ability to hold rim shape.

RIMLOCK & TYPE CR—for cutting off grooving and milling non-metallic materials such as glass, porcelain, quartz, clay products, vitrified materials, asbestos-cement, concrete, other similar substances.

FELKER DI-MET

MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

Here is a prong-type ring gage, small enough to fit into the palm of the hand. With tooth thickness of less than 1/16", the sixteen teeth are so accurately spaced that the master setting plug, which is .0001" smaller in over-all dimension, will enter the ring at any tooth engagement—proof that the COMBINED ERROR in spacing, parallelism and centrality of teeth IN BOTH PARTS cannot exceed .0002". A good gage is mechanically exact. Vinco makes good gages.

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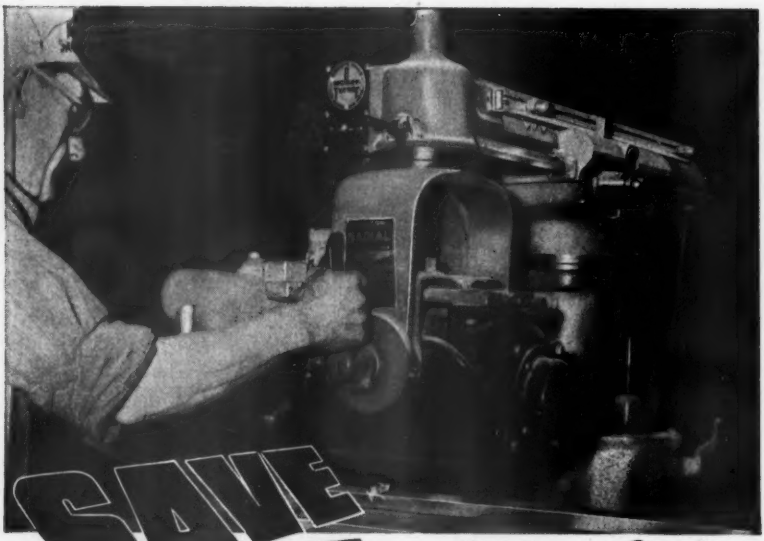

SAVE *Time, Labor, Cost*

WHEN CUTTING LONG OR BULKY WORK!

Workpieces of wide area often cause costly jams in production lines—unless you speed the work on its way with versatile Walker-Turner Metal-Cutting Radial Machines and Band Saws.

These fast, accurate machines relieve overworked, heavier cutting units, and even serve as "first line" production equipment on lighter work. Their wide range of speeds brings practically all materials within their scope. Their simple, easy operation makes every man-hour more productive.

Write today for detailed literature.

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Cutting wide, metal stock is easy with the Walker-Turner Metal-Cutting Radial Machine. Sliding ram design permits transverse travel of 21½". Geared motor—with saw shaft at bottom edge—permits deep cuts with smaller blades than in conventional motors and effects substantial savings in blade costs. Universal head makes mitering and compound mitering, as easy as straight cutting.

METAL-CUTTING BAND SAW

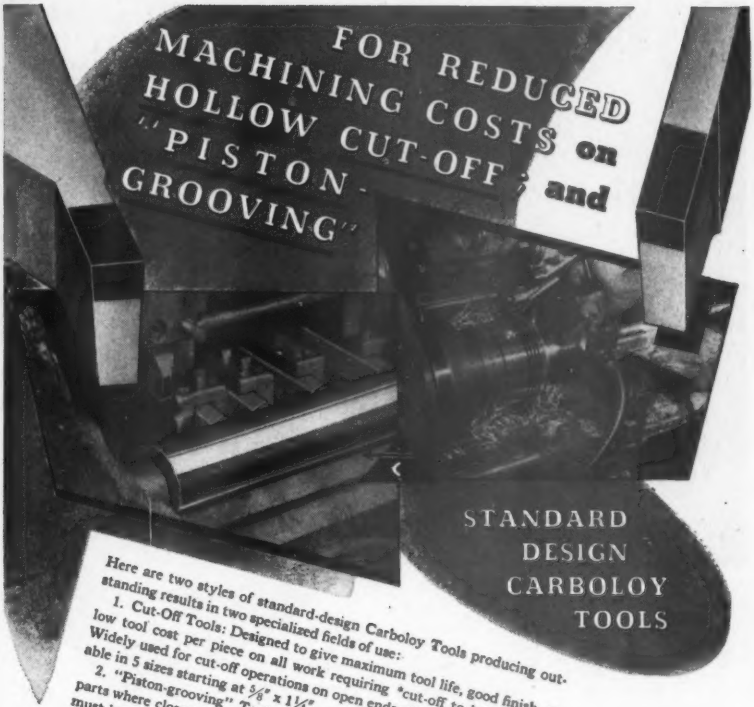
. . . profiling irregular dies . . . cutting sheets, rods and tubes of steel, iron, aluminum, brass, alloys and compositions—those are a few of the jobs Walker-Turner Metal-Cutting Band Saws are doing quickly, accurately, economically. Available in 14 and 16-inch models, these rugged, compact machines provide a speed range from 61 to 5300 s.f.m.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

E-7

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

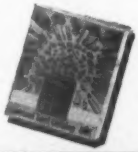


Here are two styles of standard-design Carboloy Tools producing outstanding results in two specialized fields of use:

1. Cut-Off Tools: Designed to give maximum tool life, good finish, at low tool cost per piece on all work requiring "cut-off to hollow cores. Widely used for cut-off operations on open ends of shell forgings. Available in 5 sizes starting at $\frac{5}{8}$" x $1\frac{1}{4}$".

2. "Piston-grooving" Tools: For the grooving of pistons and other parts where close tolerances, "mirror-finish", and "dead-sharp" corners, must be obtained. On such work the ability of Carboloy Grooving Tools to stand up for extra-long periods of use, at high speeds, is of unusual advantage. Available in standardized design, width to suit within a size range of .060" through .330", at established prices based upon tolerances of .002", .001" or .0004".

Write for catalog GT-175 containing complete specifications and prices.



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GET *Super* PERFORMANCE WITH THE

New SUTTON *Super* FEEDER

●Try this new Sutton Super Feeder on your automatic screw machines. Round, square or hex stock is held by multiple steel springs *in compression* (not in tension as in ordinary feeders); gripping pressure is exerted all around stock, uniform grip is spread over large area—less stock marring—less wear on feeder; a few hammer taps restores spring tension and compensates for possible wear, giving longer life, lower tool cost.

COSTS NO MORE THAN ORDINARY FEEDERS

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By the **ELOX METHOD**

The Elox method of removing a broken tool from a part being machined might very aptly be called "Disintegrator Drilling". It makes no difference how hard the broken tool may be. A core is drilled down through it by the Elox electrical disintegrator and the core removed. Then the remaining strips of thread of a tap or the cutting flutes of a drill or reamer are easily collapsed and picked out of the hole.

This method does not in any way damage the metal of the work part or the work already done on it. The temperature of the metal of the work part is not raised sufficiently to cause any metallurgical change.

The Elox method is also used to "drill" holes of various shapes in hardened dies and machine elements without annealing.

Write for Descriptive Folder and Specifications

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LIMA GEARSHIFT DRIVES
for Machine Tools requiring
selective speeds . . . 1 to 25 hp.

Large Enough To Successfully Serve You, Yet Small Enough To Give Personal Attention To Your Needs.

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LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

ONE of the best ways not to play hob with a hob is to be sure of your grinding wheel and this applies to any piece of tool room grinding. But if you want to get the best results, be sure you have a free, cool-cutting wheel that holds its shape like the "Aloxite" AA Wheel by Carborundum.

There have been a lot of new techniques developed during the last few years. New techniques in centerless grinding. New methods of cylindrical grinding. New ways to deburr, finish and polish metal. All of them have contributed to the progress of grinding. The man who knows all the angles is your Carborundum Sales Representative. Let him survey your requirements. Perhaps he can help you do even a better job. Just consult nearest distributor or The Carborundum Company, Niagara Falls, N. Y.

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34 YEARS OF RELIABILITY, PRECISION WORKMANSHIP, PERSONALIZED SERVICE

Two-week

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ON SPECIAL TAPS

This delivery covers all threads, 3-16" or larger on standard blanks. All Sossner taps are precision ground from the hardened, solid, high speed stock.

ALSO:
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SOSSNER

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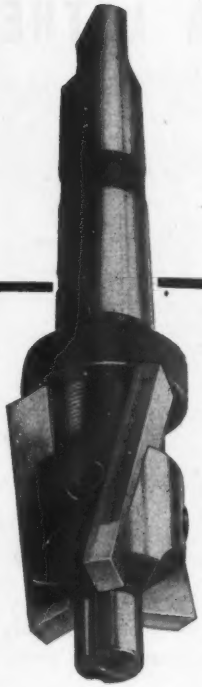


This is the only standard inserted blade type **FACING AND COUNTERBORING TOOL**

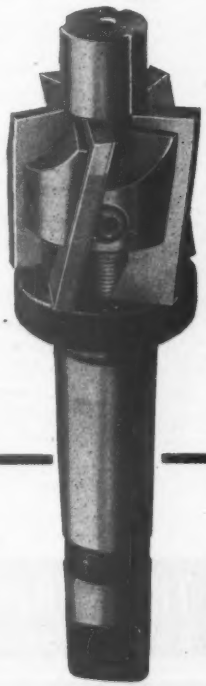
GENESEE

Replaceable Blades — Interchangeable Pilots — Constant Chip Space

STANDARD SIZES FROM 1¼ TO 4 IN. IN DIAMETER

STYLE H tools are designed for heavy cuts where maximum stock removal is required.

STYLE F tools are recommended for light finishing cuts where a very smooth and accurate finish is required.



Genesee Tools have blades set on a back slope to permit adjustment for size and regrinding diameter and front edge.

WRITE FOR COMPLETE CATALOG 44-T

ESTABLISHED IN 1908

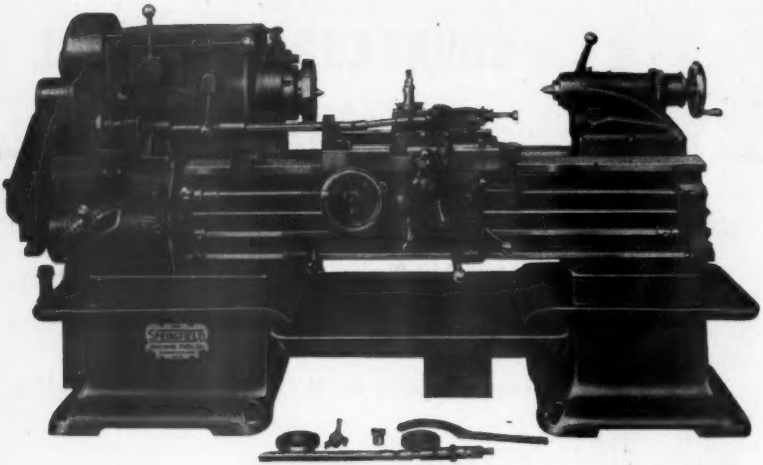
GENESEE MANUFACTURING CO., INC.

ROCHESTER 4, N. Y., U. S. A.

Adjustable Hollow Mills and Special Production Tools

SPRINGFIELD PRECISION LATHE

Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

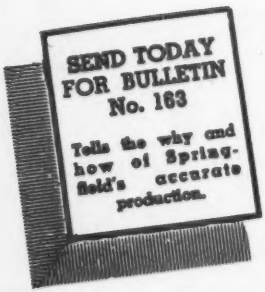
Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*



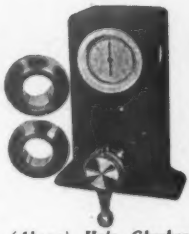
THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO. U. S. A.

Precision Checking FAST AND ACCURATE

This Thread Checker is sturdy, practical, precise.

THE old mikes in your hip pocket used to be good enough . . . but not today. Mass production of precision parts demands faster, more accurate checking of work in process as well as in final inspection. .The result has been these four American Gages, ideal for use by inexperienced help . . . anyone who can read a clock can read an American dial indicator.



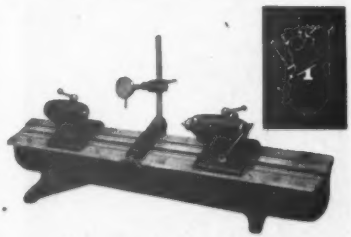
(Above) Hole Checker unit with high and low limit master ring gages specially designed for your work. (Below) Note new, modern design of Bench Center offering many superior features.

THREAD CHECKER — Checks threads on pitch diameter to "tenths", using three-wire system. Quickly adjusted. Furnished with ¾" x 4" anvil or 3¼" x 6¼" platen.

AMPLIFYING GAGE—Compact, durable, easily set to fine adjustment for checking thickness and diameters up to 5" in "tenths."

HOLE CHECKER—Indicates size, taper, bell-mouth and out-of-round condition of inside diameters. Air-operated . . . will not mar most delicate surfaces. Flexible hose connection permits work on machines to be checked without moving unit.

BENCH CENTERS—Three sizes, for 4" dia. x 10"; 6" dia. x 24"; 8" dia. x 36". Streamlined bed with inclined face provides most convenient working position. Both heads adjustable; retracting lever releases work without changing adjustment. Indicator brought quickly to any position by four-way movement of bracket. Multiple diameters can be checked simultaneously by use of extra indicator brackets and indicators.



Note convenient working position at Bench Center

Send for Bulletin 43-TDJ for complete details and prices. Prompt deliveries.

MANUFACTURERS' AGENTS—Inquiries solicited from established sales representatives in open territory.

THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"

IT'S PORTABLE

- **Saves time and steps!**
- **Can be moved from job to job in tool and die shop!**
- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet model enables this shaper to be moved about the shop.

Write today for specifications and prices

ARMY E NAVY

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.

Saws 24 inches on face of cut...can be loaded by crane

PEERLESS is the only hydraulically controlled metal cutting saw that will handle 10 x 24 inch stock without turning the work. Only a few thousandths need be allowed for planing when the sawing is done on a Peerless Vertical! The large work table permits loading by crane.

Peerless is the only Vertical Metal Cutting Saw with full automatic, hydraulic control of the feed, blade lift, blade return and elevating rollers. Because Peerless cuts so true and square, critical stock is saved, enabling tool and die makers to use scrap pieces for smaller dies, strippers and stripper plates.

Mail the coupon for estimate of cutting time on your toughest operation and full details of the Peerless Vertical Metal Cutting Saw.

PEERLESS
MACHINE COMPANY
RACINE · WISCONSIN

Dept. TDJ. 844

☐ Mail catalog on Vertical Type Die Block Saw.
☐ Mail catalog on Hydraulic Type Saw for High Production Cutting.
☐ Mail catalog on Mechanical Type Saw for production cutting.
☐ Mail catalog on general utility and maintenance Saws.

Company_____
Individual_____
Street_____
City_____ State_____

Here's an outstanding time and money saving tool for your parts numbering operations—*the Mercury Interchangeable Type Holder.* It provides for fast, accurate and fully legible numbering of metal parts, eliminating errors, rejects and the time normally consumed in using single-character dies.

HERE'S ALL YOU DO:

Unlike ordinary one-character dies, which must be used separately, the Mercury holds the entire part number—up to 16 digits, if needed. You simply "load" the tool with the correct part number and snap the cover shut. *Thereafter, as many duplicate parts as desired can be quickly and neatly stamped with just a single blow of the hammer for each part!* Time normally lost using a separate die for each separate digit is *saved,* and overlapping, wrong sequence and illegible numbering are eliminated.

The Mercury Type Holder has many more outstanding features you should know about. Type is quickly interchangeable for different part numbers . . . compactness aids in stamping smaller parts . . . all-steel machined construction insures long life, cuts replacement needs. Hardened and ground hand-cut steel type is available in a full range of sizes. Full details, including ordering data and specifications for both hand and press style holders, are contained in descriptive bulletin mailed free on request. Write for your copy today—ask for Mercury Bulletin 1-D

Immediate Delivery

MERCURY METAL DIE AND LETTER CO.

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

WHEN YOU TAKE THE TOOL *to* THE JOB

RB-4

TAKE A HASKINS

There's only one answer where a portable tool of constant power is indicated—Haskins Flexible Shaft Equipment. Light and easy to handle, yet sturdy and dependable, it will turn out more work and better work—faster. Fatigue is negligible. Thirty models, each capable of handling many different jobs. Write today for your copy of Catalog 45. R. G. Haskins Company, 625 So. California Avenue, Chicago, Illinois.

HASKINS
Flexible Shaft
EQUIPMENT
More VERSATILE Machines for More PROFITABLE Work

PUT POST-WAR PLANS INTO ACTION NOW!

BUY WAR BONDS NOW... SAVE FOR LATHES

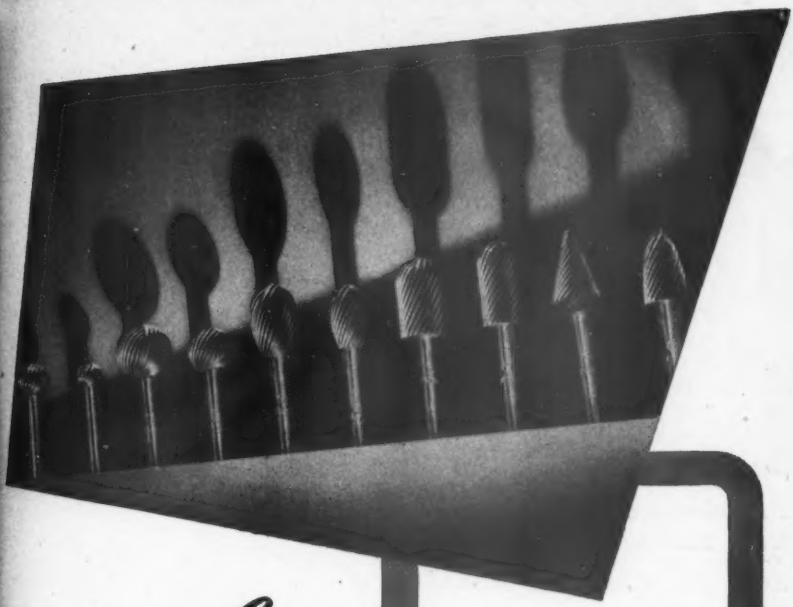
War production is still urgent—still our first job. But alert executives are now making plans that will permit a quick change-over to peace-time production. Many are already putting their post-war plans into action by placing orders for machinery to be delivered after the war is won. To help you put your post-war plans into action now, we have developed a practical post-war priority plan on which you can order South Bend Lathes for post-war delivery.

To take advantage of this plan, it is only necessary that you place your order now. No deposit or down payment is required. We ask only that your order be placed in good faith. Each order that is received will be acknowledged by a numbered Post-War Priority Certificate. When civilian production is resumed, lathe orders will be filled as nearly as possible in the order established by the certificate numbers. The order may be cancelled at any time.

Investigate this effective plan that will help strengthen your post-war position. Write now for details of our Post-War Priority Plan and copy of Catalog No. 100-C.

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA • *LATHE BUILDERS FOR 37 YEARS*



FORD *Carbide* CUTTERS

THE FIFTY TO ONE FILE FOR FASTER CUTTING IN HARDER METALS

Fifty to one—that's the performance you'll get from Ford Carbide Cutters over those of ordinary high speed steel. It's the *Quality* tool—harder biting, faster cutting, longer lasting—keeps production at its peak. Available in 20 sizes and 7 shapes. Write today for complete details from FORD, on carbide, the Aristocrat of Files.

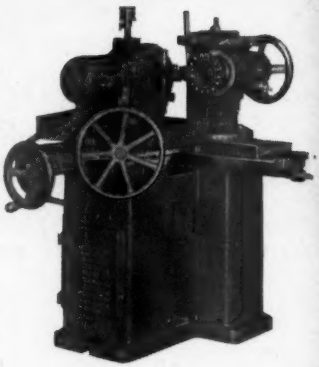
FORD

M. A. FORD MFG. CO., INC.
739 W. FIRST STREET DAVENPORT, IOWA

. . . Assure a Greater Return From Your Milling Machine Investment

Avoid waste of valuable productive time by constant changing of face mill cutters. The Milwaukee Face Mill Grinder sharpens each tooth accurately — makes cutters last longer — require less frequent re-grinding — decreases "down-time" on your milling machines.

An indispensable machine of strength, precision and capacity, the Milwaukee Grinder grinds Tungsten Carbide and other cutters, ranging from 3 inch to 16 inch diameters, to within .0002 runout — and does it fast.



MILWAUKEE FACE MILL GRINDER FEATURES:

- Unusual Rigidity
- Accuracy to within .0002 runout
- Finger-tip controls — handily located for simplified operation
- Design and performance of the Milwaukee substantially reduces sharpening time
- The three-bearing dynamically balanced grinding wheel spindle rotates at 3400 r.p.m.; heavy flywheel keeps abrasive wheel up to full grinding speed — maintains accurate uniform cutting action — each tooth perfectly ground.

- Set-ups quickly made with graduated dial, facilitating quick adjustments

For complete information write for Bulletin 41-A

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
Milwaukee Midgetmill
Milwaukee Speedmill

Something New Has Been Added to HEIGHT GAGES

it's a — Fine Adjustment and a FEDERAL TESTMASTER

No more "tapping" is necessary when you set the Indicator to the gage blocks or master to the required measurement. The **fine adjustment** of the Indicator Bracket brings it into position positively and yet as lightly as a feather. The Bracket can be set anywhere on the upright.

MODEL 1492
18" CAPACITY
Complete with —
FEDERAL
Testmaster No. 1, $55.50
or
Testmaster No. 2, $60.00

You get all three with the Model 1492, the Federal Testmaster Indicator, the Fine Adjustment Bracket and the 18" Stand, in a handsome wooden case. You will find it is more convenient, more precise and requires no figuring. Just set to gage blocks or master and check. Write for further details to —

FEDERAL PRODUCTS CORP.
1144 EDDY STREET, PROVIDENCE 1, RHODE ISLAND

You can set the Testmaster Indicator at any angle — down in a hole, sidewise, or close up to the bracket

★ ★ ★ ★ ★ FEDERAL ★ ★ ★ ★ ★

TRACER CONTROLLED

Get the corners, too!

ALMOST any milling machine can mill straight across a surface in a horizontal or vertical plane, but it takes a particular type of machine to profile mill around a boss and get the corners that would be missed by a conventional miller. The CINCINNATI Tracer Controlled Hydromatic in the illustration at the right does the job *automatically;* milling the counterweight surface of aircraft engine crankshafts, while profiling around the center bearing, like this: ⌒

The equipment, engineered by CINCINNATI, includes two hand clamping fixtures. Automatic feed cycles (a feature of all Hydromatics) permit the operator to devote his entire attention to the productive job of loading and unloading the fixtures, working at one station while the other is cutting. Automatic variable feed is also included, as a necessary adjunct to tracer controlled milling.

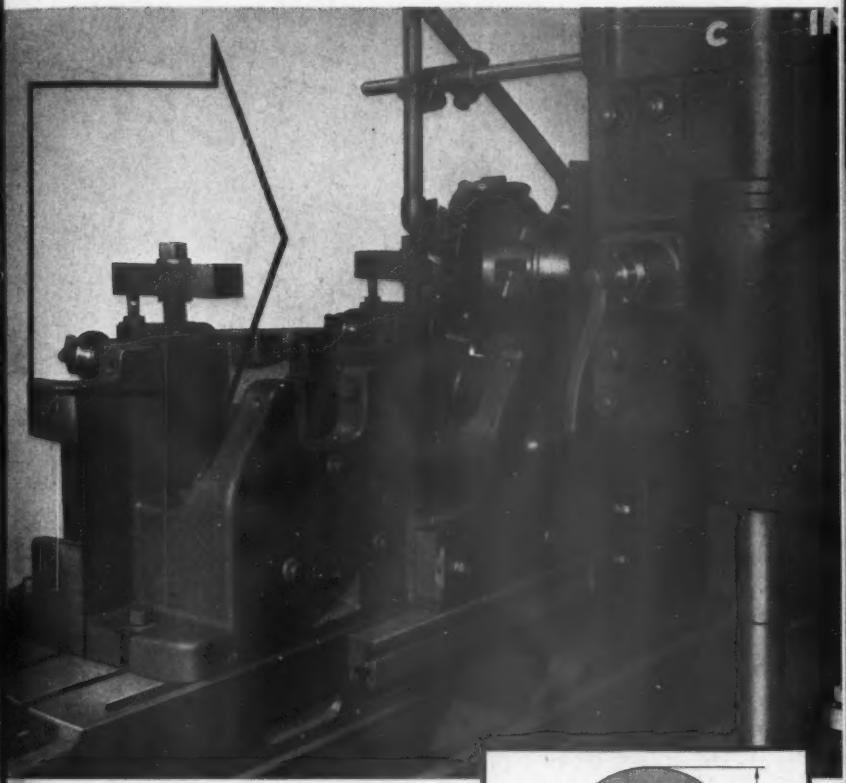
This method of milling introduces new possibilities in economical shop practice. Our engineers will be glad to tell you about CINCINNATI Tracer Controlled Hydromatics, and to apply the tracer controlled method of milling to your present and future requirements.

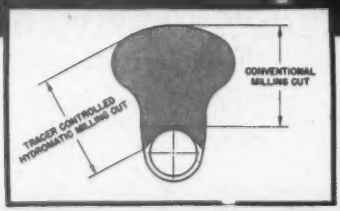
CINCINNATI

Illustration of part being milled is shown above. Color indicates milled surfaces. The machine (tooled up by CINCINNATI engineers) is a 5-48 Plain Tracer Controlled Hydromatic equipped with variable feed attachment; high headstock for increased vertical range; long quill and spindle for extended cross range; and inserted tooth cutter, 13" diameter by 3-1/16" wide.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENIN

HYDROMATICS

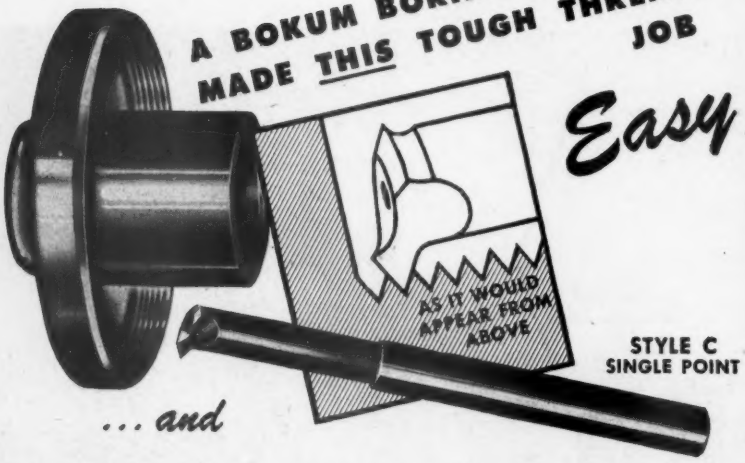




Left: CINCINNATI Plain Tracer Controlled Hydromatic. Also available in Duplex Style. Catalog M-1295 contains complete specifications on both styles. A copy will be sent on request. Sweet's Catalog File for Mechanical Industries gives a brief description of all CINCINNATI Milling Machines.

MACHINES . CENTERTYPE GRINDING MACHINES . CENTERLESS GRINDING MACHINES . CENTERLESS LAPPING MACHINE

A BOKUM BORING TOOL MADE THIS TOUGH THREADING JOB Easy



... and

IT WILL MAKE YOUR THREADING JOB EASY

Shank of tool is lined up parallel with line of centers. Bisecting line of thread is always at right angles to machine axis.

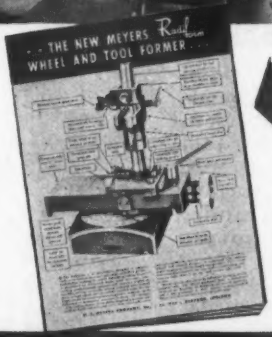
In blind holes, threads can reach clear to bottom—no other tool like it. Easy to use. Reconditioning does not change ground thread form (tool is resharpened on top surface only). Results: accuracy and long life.

Ask for Catalog E-1139 for Super High Speed Tools and for E-398 for Carbide Tipped Tools.

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

Radiform
TRADE MARK REG.



PAT. PENDING

FREE . . . Illustrated Catalog and Operator's Manual

Actually a valuable text book on tool forming methods. Contains complete step-by-step operating instructions for forming carbide tipped as well as high speed steel tools directly against wheel—including precision radii on spiral fluted end mills and drills. No machine shop should be without this valuable guide. Write for free copy.

Copper Head Laps are Economical to Use. The only Wearing Part is the Replaceable Copper Sleeve.

COPPER HEAD LAPS PAY FOR THEMSELVES IN TIME SAVED

Costly tool room time is saved when you use Boyar-Schultz Copper Head Laps. They are also fast working . . . a double saving. Copper Head Laps never wear out; sleeve adjustment feature permits maintaining correct lapping size till worn out when it is replaced with a new sleeve. Available from Stock in standard sizes, 1/8" to 2 1/2".

BOYAR-SCHULTZ SMB MACHINE BOLTS
SAVE the Machine - SAVE the Job - SAVE Time

Heat treated alloy steels make them T O U G H for heavy work; machined heads and carefully cut threads make them A C C U R A T E for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

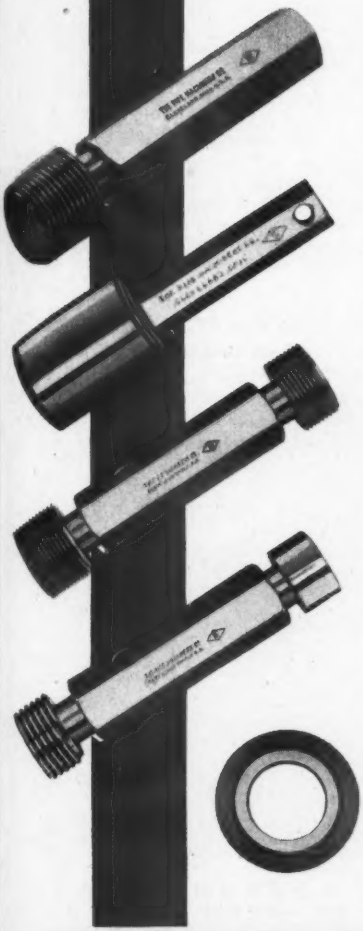
Avoid worn or poorly made bolts. They can cause costly damage to machine beds, ruining the machine's accuracy.

For best results, use SMB Nuts and Washers. They are specially made for use with SMB Bolts.

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street **CHICAGO 12, ILLINOIS**

GAGES
from a fine family



Two things you look for when selecting Gages—initial accuracy and maintained accuracy.

Gages bearing the PM Diamond Emblem qualify on both of these excellent family characteristics.

Beginning with the right steel, we machine and grind to the high standards demanded by today's precision work, and then finish to insure long life in service.

Pipe Machinery maintains a large stock of standard Plug, Ring and Thread Gages, from which prompt shipments are made to meet emergencies. Wire Department EX for this quick delivery service.

Special Gages and Cutting Tools are engineered by experts and built on special order. Send us details of what you want to accomplish.

ARMY E NAVY The PIPE MACHINERY COMPANY Cleveland, O.

How to Duplicate Factory Finish till Taps are WORN TO A FRAZZLE!

Now, with this Universal precision indexing head you can grind completely in 5 minutes what normally takes 2 to 3 hours of laborious trial and error work—and duplicate the factory finish on as many taps as you want, till they are worn away completely.

INDEXES 360° IN THREE PLANES

This remarkable attachment holds tools firmly, indexes 360° in each of three planes, for any possible simple or compound angle you may want. Bolts onto any tool or surface grinder. Gives you higher precision work because you needn't shift tool in Head. Vernier lever rotates work collet between adjacent indexed points without changing index, giving you control to 1/10 of 1 degree.

You eliminate inaccuracies because all work is accomplished by mechanical setting, and less handling is required. Collet quill is carried on aviation ball bearings instead of ordinary sleeve bearings to reduce friction for spiral grinding. Result is greater accuracy and speed in regrinding tools.

GET COMPLETE STORY!

Investigate this unusual grinding attachment. In addition to holding all the standard tools listed below, it is easily adapted to holding irregular and large shank tools for grinding. Some even use it for light milling work. Write today for the whole story. It will pay you.

UNIVERSAL THREE PLANE INDEXING HEAD is the only head of its kind . . . can be used on ANY tool or surface grinder . . . holds straight shank, No. 4 Morse Taper and No. 9 B & S Taper tools.

1 Holds straight shank tools up to 1" diameter in standard Hardinge Pull-In collets (Type 1-AM).
2 Quill is ground to hold No. 4 Morse Taper tools.
3 With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper.
1
2
3

CLEVELAND
TOOL ENGINEERING CO.
1261B W. FOURTH ST.
CLEVELAND, OHIO

SEND COUPON TODAY!

CLEVELAND TOOL ENGINEERING CO., 1261B W. Fourth St., Cleveland, Ohio

Please send complete story and Data Sheet B showing how Universal Indexing Head can help me.

NAME .....

ADDRESS .....

CITY .....STATE .....

"Sterling" Stainless Steels

FOR DISCRIMINATING USERS

A complete line of wire, rod and bars

FIRTH-STERLING—a mill with a national reputation for consistently high quality Tool and Alloy Steels—is in a unique position to meet the special requirements of discriminating users of Stainless Steels. Since 1913, when FIRTH-STERLING made the first Stainless Steel produced in this country, we have specialized on made-to-order types for the most exacting specifications. Literature is available, giving complete details.

"Sterling" Stainless Steels Meet Special Requirements such as:

1. Closely Controlled Compositions.
2. Exacting Physical Requirements.
3. Surface Perfection in Various Finishes.
4. Precise Size and Shape Tolerances.

Ask For:

Bulletin No. SL-2009 on Types 420, 440-A, 440-B, and 440-C.

Bulletin No. SL-2010 on Types 403, 410, and 416.

Bulletin No. SL-2011 on Types 302, 303, and 304.

Bulletin No. SL-2018 on Cold Finished Stainless Steels.

Makers of Fine Stainless Steels Since 1913

Firth-Sterling

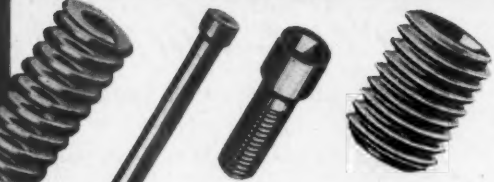
STEEL COMPANY

Offices: McKeesport, Pa. New York - Hartford - Philadelphia - Cleveland - Dayton - Detroit - Chicago - Los Angeles

NEED THESE DIE

ACCESSORIES?

Call "DETROIT"



CALL "DETROIT"

DETROIT	TR 2-5150
INDIANAPOLIS	LI 3884
MINNEAPOLIS	AT 5264
DAYTON	HE 3042
TOLEDO	GA 5706
SEATTLE	SE 2090
PORTLAND, Ore.	BR 0561
SAN FRANCISCO	MA 8532
NEW YORK	CA 6-1760
BUFFALO	PA 9206
PHILADELPHIA	VICtor 4084

● Our large stock of die accessories of all kinds assures prompt shipment.

Dowel pins in 163 standard sizes (plus oversizes) ground to exact diameters, carburized, hardened and tempered to case hardness Rockwell C. 60-62 effective to depth .020" and core hardness Rockwell C. 50-54.

Standard and Special die sets in all sizes.

DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. DETROIT 2, MICH.

DETROIT DIE SETS ★

Now—for the first time—standardized air gage spindles and components for checking long, short, through or blind holes at the gage or remotely at the machine or bench. You *can write your own specs!*

No more engineering time and charges! Deliveries shortened to a matter of days. Interchangeability of spindles and components enables adoption of complete air gaging program at minimum cost and minimum gage inventory.

No more GO and NO GO checking of internal diameters. Both tolerance limits are checked in one pass faster than either could be checked with a plug gage. Frequent, time-consuming and therefore costly, inspections of gages are eliminated. Precisionaire spindles outlast plug gages 10 to 40 times.

No more human element of error when you use the Precisionaire. Parts with tolerances ranging from .005" to fractions of .0001" can be checked quickly by unskilled and untrained operators who merely present the gage to the part or vice versa.

WRITE for Engineering Data No. 12 detailing STANDARDS and also showing SPECIAL applications.

In the face of production changes and cancellations, high tool inventories are a costly *and unnecessary* risk. TECO Cemented Carbide permits you to keep tool inventories at low levels, while insuring *peak production*. Here's why:

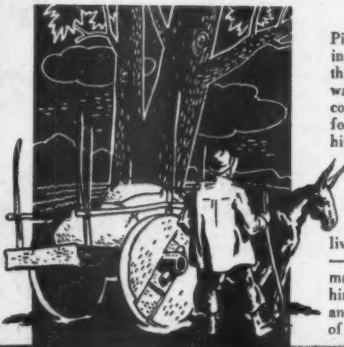
TECO Cemented Carbide does so much more work, fewer replacements are needed. Its extremely hard, dense, uniform structure provides extraordinary resistance to wear and breakage. As a result, it produces more pieces between grinds and stays on the job longer than any other cutting material.

Let these advantages of TECO Cemented Carbide help your war production today—and your postwar profits tomorrow. Have one of our tool engineers discuss your needs. Write for catalog and new price list covering grades, sizes and styles for practically all machining needs.

TUNGSTEN ELECTRIC CORPORATION 574 39th Street, Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representatives: Indianapolis, Ind. • Chicago, Ill. • Detroit, Mich.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

what has this to do with broaching?



THAT depends upon how you look at it. Pictured here is a crude, two wheeled cart, still used in transportation. The wheel is a pretty commonplace thing these days — yet the wheel, as time has proved, was one of the most revolutionary inventions for the comfort and convenience of Man. In its rudimentary form it took heavy loads from Man's back and gave him greater mobility. As a means for utilizing the tremendous energy of falling water, the water wheel harnessed nature to turn other wheels — to grind corn and to power the earlier machines which in turn allowed Man to work *less* . . . and produce *more*. Almost unrecognized it exerted a profound influence on our lives and habits. In modern streamlined transportation — railroad, automobile, airplane — the wheel enables man to have far greater pleasure in the world about him, vacationing and visiting with friends both near and far. Actually, civilization has sprung from the ruts of countless wheels.

So, too, with Broaching . . . from a primordial type of drilling to present day precision production, Broaching's principles have been amplified until they now cover the entire metal-working field. Just as the use of the wheel expanded from the crude vehicle stage to its present use in diverse sizes and shapes . . . in intricate machinery making countless tools, machines, and vehicles for Man's even greater comfort and convenience . . . just so will Broaching become an increasingly powerful influence in making machines to turn out more and better and cheaper products to lessen Man's work and increase the joy of living.

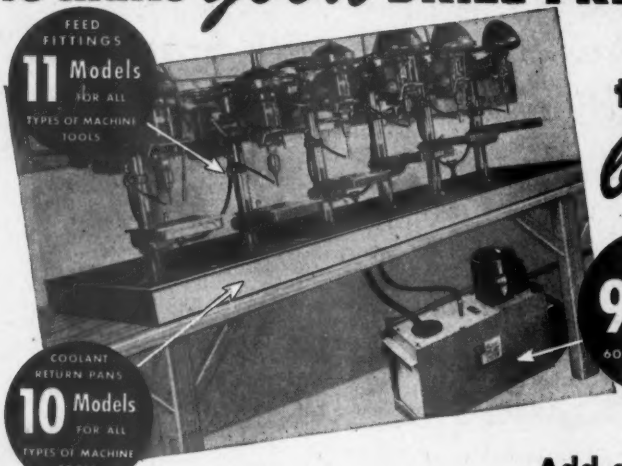
Earliest historical references to Broaching mention use of a toothed tool to form tap holes in wine barrels.

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

MANUFACTURERS OF BROACHES AND BROACHING MACHINES

to make *good* DRILL PRESSES do their *best*



Add a GRAY-MILLS *Coolant System* to all machines.

To speed production and be sure of getting the best out of tools and machines, you simply equip them with Gray-Mills Coolant Systems. They apply the exact amount of coolant needed directly on cutting tools, to speed production, prolong tool life and improve finish. The units are very easy to install and low in cost too. There is a complete range of standard Gray-Mills pumps — gear and centrifugal — coolant return pans and fittings to suit most any application.

Let your machines do their best—and help your tools give better service longer, by installing Gray-Mills Systems. See your Mill Supply distributor or write us for complete details and a catalog.

PROMPT DELIVERY

GRAY-MILLS CO.

1951 Ridge Avenue • Evanston, Illinois

Complete Portable COOLANT SYSTEMS

FRACTIONAL H. P. PUMPS

INDUSTRIAL FLUID REFRIGERATING SYSTEMS

The Spotlight is on NORBIDE*

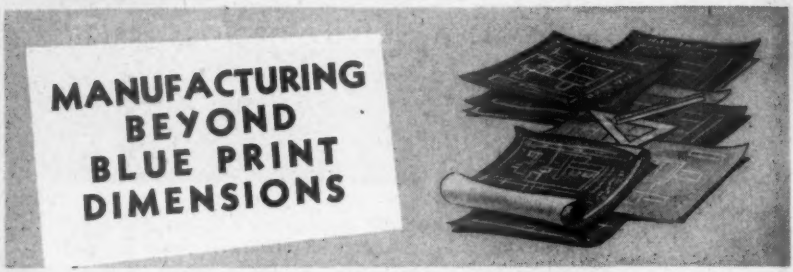
INCREASES GAGE LIFE *100 times!*

NORBIDE plug gages, ring gages and inserts for dial indicator gages outlast conventional types of measuring devices 100 times and more. NORBIDE (Norton Boron Carbide) is the hardest material commercially produced and is lighter than aluminum. Therefore, NORBIDE gages possess great wear resistance, do not require frequent checking on production work and are light and easy to handle, even in large sizes. Your regular gage manufacturer can supply NORBIDE gages, or for further information write to:

NORTON COMPANY
Worcester 6, Massachusetts

*Hardest material made by man

PRECISION PARTS



To Allow the Highest Possible Standards

In manufacturing precision parts the C. M. Smillie Company applies quality control from blue print to the finished part.

Before a job is started every blue print is checked for dimensions and tolerances, and processing of work is begun. This engineering control prevents costly rejections — and has accounted for time and material saving improvements.

The second quality control is special production tools—jigs and fixtures of our own design built here in our complete tool and gauge shop—to accurately meet these individual requirements.

In processing production C. M. Smillie maintains a third quality control — combining modern equipment and skilled operators in every operation—machining, grinding, thread milling, finishing and inspection. This co-ordinated engineering, tooling and production precision control is responsible for our high rating in the production of Army and Navy material.

In production after Victory forward-minded executives will recognize that this true precision performance means *extra* value in their products.

C. M. SMILLIE & CO.

1108 WOODWARD HGTS., FERNDALE, MICH.

TOOLS PRECISION SCREW MACHINE PRODUCTS FIXTURES

PRECISION ◆ YESTERDAY ◆ TODAY ◆ TOMORROW

SERVING INDUSTRY AND THE NATION FOR FIFTY-FIVE YEARS

The C. M. Smillie Company is interested in developing precision products for post war manufacture. To parties with new inventions or products we have the experience, facilities and organization for successful manufacturing and distribution.

It pays to have your worn cutters reground by Severance

Worn, dulled cutters reground by Severance are exactly the same as new. Severance regrinders are not just "regrinding experts," they are the same new tool craftsmen, using the same precise skill and care as they do in grinding new tools from the solid.

After regrinding, each cutter is further improved by the exclusive "Severite" heat-treat process that increases tooth hardness and thus lengthens cutting life from three to five times. This "Severite" heat treatment costs you nothing—it is simply another of the many ways in which Severance gives you more for your regrinding dollar.

Severance service, too, is an advantage to you. There are six complete Severance plants located strategically throughout the United States. Check up on the worn cutters, rotary files, burrs, etc. in your plant now. For best service, send them to the Severance plant nearest you for a factory regrinding job.

Severance

MIDGET MILLING CUTTERS • **PRECISION REGRINDING**

Severance Tool Industries Inc., Saginaw, Mich. • Plants in Long Island City 1, N. Y.; Detroit 2, Mich.; Fort Wayne 8, Ind.; Chicago 6, and Los Angeles 21. • In Canada: 60 Front St., W., Toronto, Ont.

CONTRACT TOOLING AND PRECISION PARTS DESIGN AND MANUFACTURE

A STAFF of capable engineers with broad industrial experience and an organization of highly skilled craftsmen and machine operators.

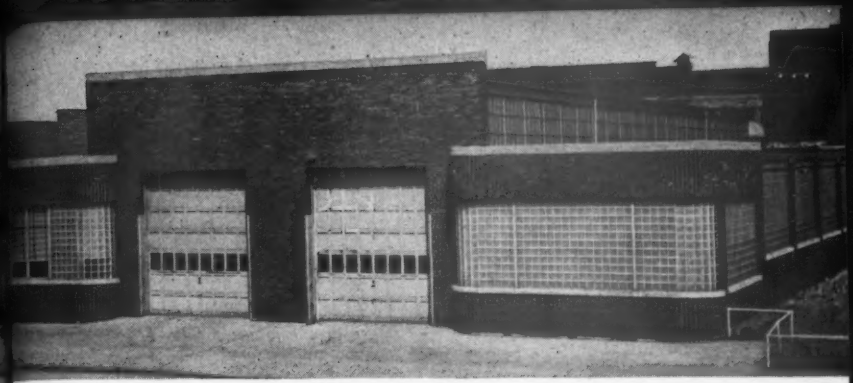
Our inspection is comprehensive and dependable. We have installed practically every type of needed instrument.

Our supervisory staff has had an important part in war products tooling and precision manufacture, which with a total of 23 years of general contract shop service, we believe qualifies us for your consideration. Our capacity is large and we have portions of it available from time to time.

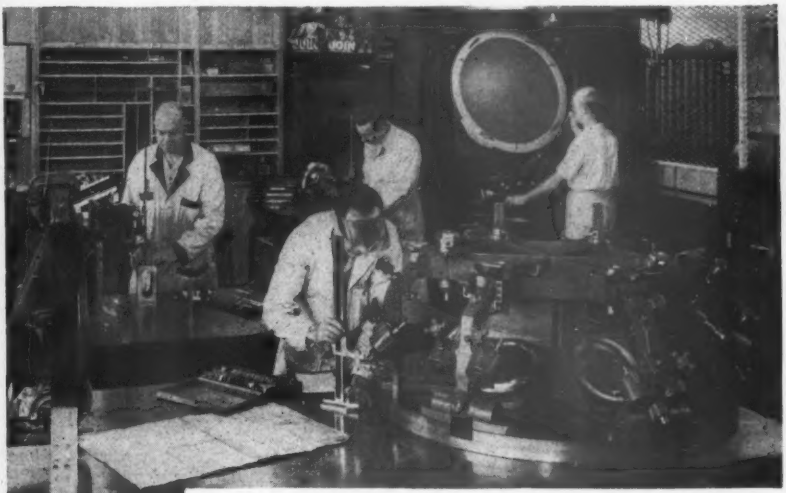
Write for folder listing our facilities.

THE BUNELL MACHINE & TOOL COMPANY

1601 EAST 23RD STREET • TELEPHONE CHERRY 0343 • CLEVELAND 14, OHIO



Chamber of Commerce award as the best small industrial plant completed in 1941-42.

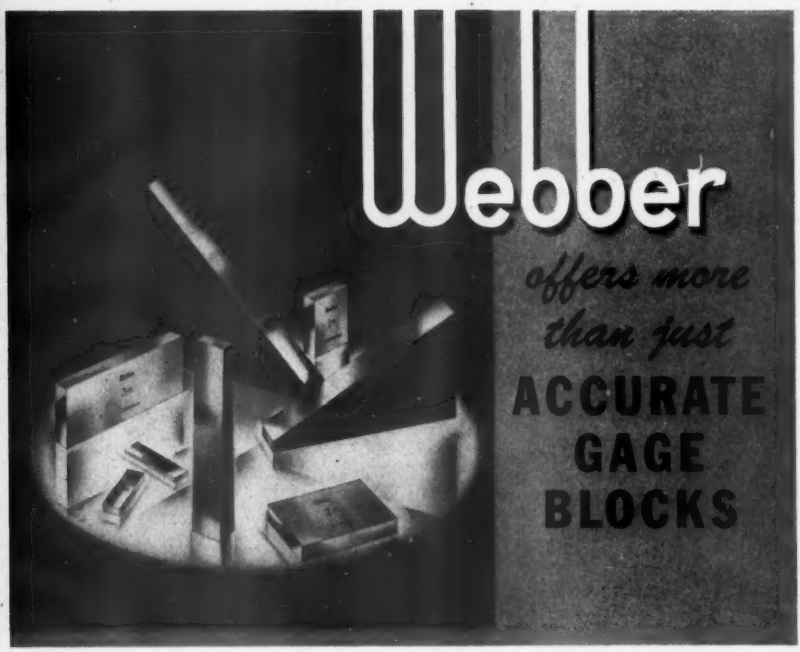


Our inspection facilities consist of modern equipment, always adequate for specified tolerances. Our inspection engineers are qualified and experienced.

DESIGNERS AND MANUFACTURERS OF

Tools • Special Machinery • Dies • Jigs • Gauges • Fixtures

PRECISION PRODUCTION OF PARTS AND ASSEMBLIES



Investigate Webber Service after the Sale!

• Dimensional Accuracy—Stability—Surface Finish—Wearing Quality are inherent qualities of all Webber Gage Blocks. They are the result of years of research—long experience in making precision gage blocks—the combination of modern methods of production under ideal conditions—and the exclusive manufacture of precision gage blocks.

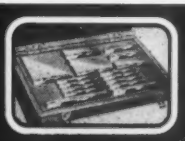
Thus Webber assures dependably accurate measurements on every step of your production from tool room to assembly. But Webber service doesn't stop here. It provides complete facilities for inspection—and replacing worn or damaged blocks at a moderate cost.

The Webber 84-A Set of gage blocks contains two 1.00" wear blocks and one .10005" block in addition to the regular blocks in the set. This adds immeasurably to the life of the set and makes possible about double the number of measurements of the average set.

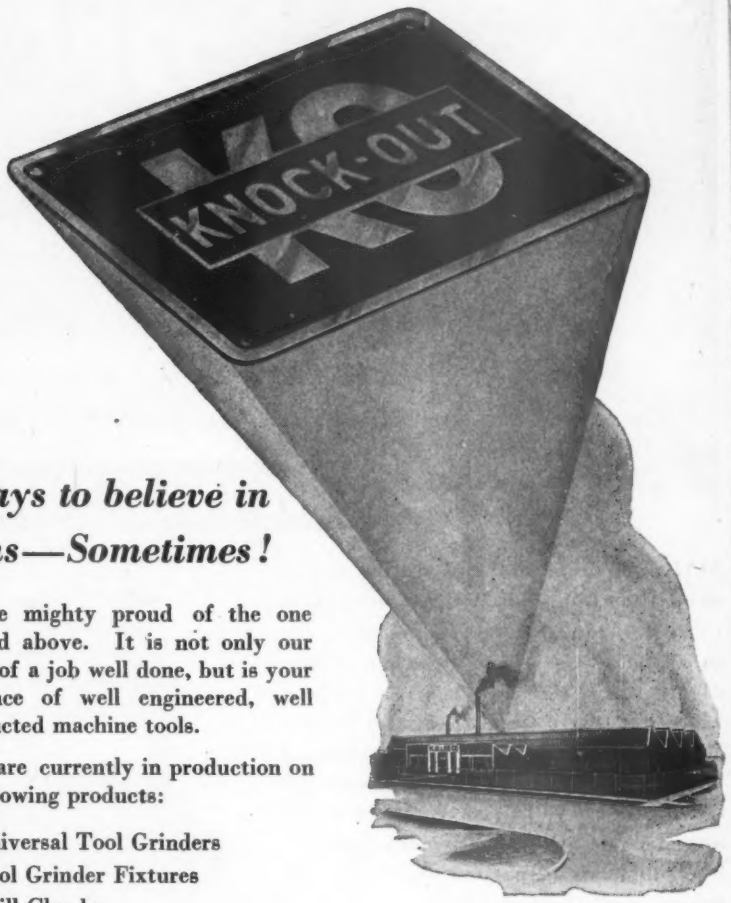
Webber service also includes an Angle Gage Set permitting the accurate measurement of 370,800 angles up to ¼ second of an arc—easily and quickly.

Webber Gage Sets are furnished as follows—

Set No. 84A—$350.00	Set No. 84B—$235.00
Set No. 43A—$185.00	Set No. 43B—$150.00
Set No. 38A—(Thin Blocks)	$195.00
Set No. 38B—(Thin Blocks)	$155.00
Set No. 14A—(Angle Blocks)	$450.00



Webber
GAGE COMPANY
12903 TRISKETT RD. • CLEVELAND 11, OHIO



It pays to believe in Signs—Sometimes!

We're mighty proud of the one pictured above. It is not only our stamp of a job well done, but is your assurance of well engineered, well constructed machine tools.

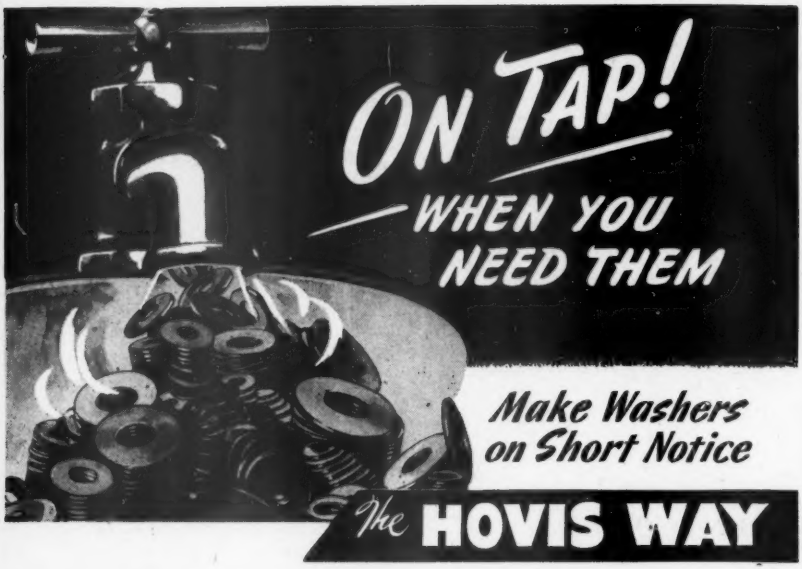
We are currently in production on the following products:

- Universal Tool Grinders
- Tool Grinder Fixtures
- Drill Chucks
- Expanding Mandrels
- A. C. Arc Welders
- Reamer Drives
- Abrasive Wheel Dressers
- Hand and Tool Post Grinders

Literature on any or all products will be gladly sent to you on request.

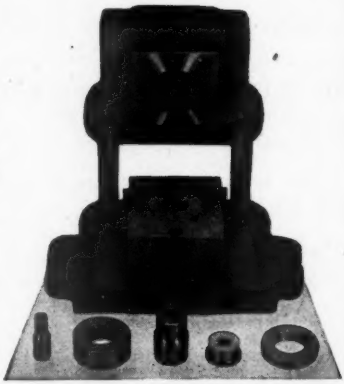
K. O. LEE COMPANY

Aberdeen, South Dakota



MAKE washers on quick notice as you need them. No costly delays; no need to keep large inventories on hand. No more is it necessary to make a new die for each size and type of washer. Merely invest in Hovis Universal Master Washer dies at a nominal cost; then 5 EASILY REMOVABLE INTERCHANGEABLE PARTS are all you need to buy to make any size washer. No process engineering, tool designing, tool making or tool tryout. *Get the facts now.*

WRITE FOR LITERATURE



When planning your postwar products, remember that a number of Hovis Master Washer Dies have been in continuous use for more than 4 years, and the Master Dies themselves do not become obsolete. A new set of interchangeable parts is all that you need for your new products.

Made in 4 sizes:
¾"—1½"—2½"—4".

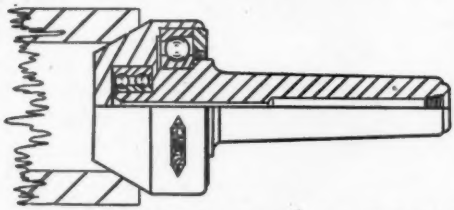
HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD — Suburb of Detroit Phone: Centerline 1575 — **VAN DYKE, MICHIGAN**

FAST
DELIVERY
PLUGS
SNAPS
FLUSH PINS
TURNER
Be sure to wire or write our sales department today for delivery dates on the Turner gauges listed above.
TURNER BROTHERS
TURNER GAUGE GRINDING COMPANY
2625 HILTON ROAD
FERNDALE, MICH.

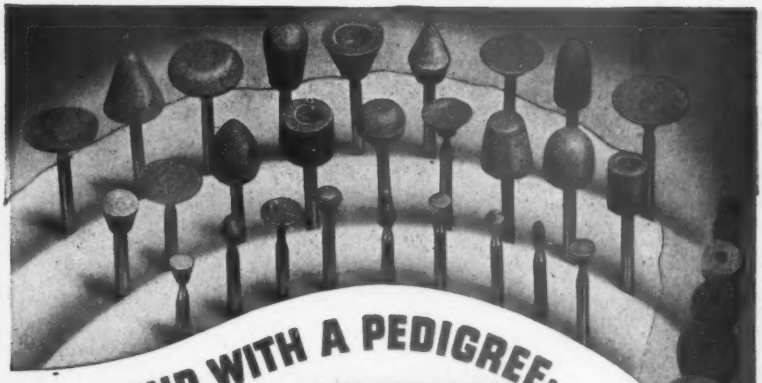
LIVE CENTER *adapted to Tube Turning*

The basic design of the STURDIMATIC Live Center is ideally adapted to tube turning . . . extra large sections are no problem with this set-up . . . in most of these cases (see mechanical drawing) there is a tool clearance . . . Characteristic of all STURDIMATIC design is this low overhang which together with a slight cushioning action, that compensates for expansion, due to heat, shock and excessive thrust loads—reduces wear to a minimum . . . we will see that your job gets set-up with the right LIVE CENTER . . .



Standards with Morse Tapers (2 to 6) Carried in Stock.
Special LIVE CENTER for turning extra large tubing.

STURDIMATIC TOOL COMPANY
5218 THIRD AVENUE
DETROIT 2, MICHIGAN



THE BOND WITH A PEDIGREE..

FV

A thousand test formulas . . . hundreds of bonds of various kinds . . . fifty years experience making bonds for the world's best grinding wheels . . . this is the Pedigree behind the new FV Bond.

FV Bond holds wheel shapes firm even when run at high speed, and produces a satin-like finish that is so accurate it passes any surface analyzer test hands down.

FOR THAT PERFECT FINISH

Today's precision instruments and tools as well as mass production of war equipment parts, call for finishes with closer tolerances than ever before—finishes that can be measured in micro inches. Just any old wheel won't do. That's why this better bond—FV—was developed for all Chicago Wheels. There's a best grain, grade, size and shape wheel—all made with FV Bond—for each kind of material to be finished—a whole army of Chicago Wheels at your service.

CHICAGO MOUNTED WHEELS— All the most needed shapes, each mounted firmly on its own steel shank to last as long as the wheel itself.

CHICAGO GRINDING WHEELS— For the duration, with full WPB approval, we are specializing on sizes up to 3" in diameter only.

FREE ENGINEERING ANALYSIS

Some of the new metals, alloys and laminates present real grinding problems. If you have a job that stumps you, our experts will work with you to determine the best wheel to give the job *that perfect finish* in the quickest time.

Write for Catalog & Engineering Survey Form

TRY ONE!

It's the quick way to find out about FV Bond. We'll make it easy for you by sending, without charge, one size you name.

CHICAGO WHEEL & MFG. CO.

1101 West Monroe St. **Dept. TD, Chicago 7, Ill.**

Send Catalog and Survey Form. Interested in:
☐ Grinding Wheels ☐ Mounted Wheels TD 8
☐ Send Test Wheel. Size.....

NAME.....

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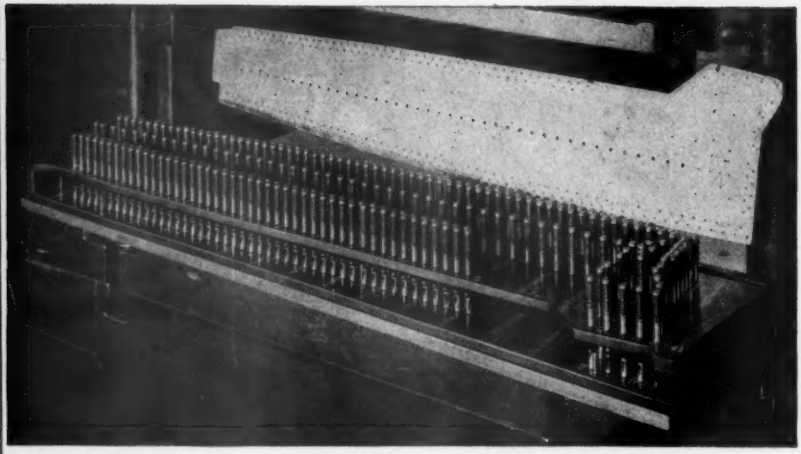
A NEW WAY TO PUNCH HOLES



Showing Wales Plate Set System that has punched 291 holes in part shown in background.

- **SIMPLE**
- **ECONOMICAL**
- **SAFE**
- **EASY, QUICK TO SET UP**

WALES

PLATE SET SYSTEM

Wales Plate Set System is self-contained. No die setting skill . . . no adjusting . . . no aligning is required before or after the Assembly is placed on press bed.

Wales Plate Set System practically eliminates "burring."

During the production run, punches may be replaced instantly without disturbing the set-up and without adjustments. Nothing is attached to press ram.

The time-saving, money-saving advantages of Wales Plate Set System are fully described in Catalog PS. Write for your copy TODAY.

WALES-STRIPPIT CORPORATION

355 PAYNE AVENUE **NORTH TONAWANDA, N. Y.**

(Between Buffalo and Niagara Falls)

GEORGE F. WALES, President

Specialists in Punching and Notching Equipment

FROM NOW ON

Production Economies Count

SAVE TIME, LABOR, MATERIAL, MONEY

with

SIEWEK

STANDARD RAPID CLAMPING DRILL JIGS

Spring or Rack and Pinion Types—Square or Oval Top Plates—Wide Range of Sizes

● Siewek Rapid Cleaning Drill Jigs, speeding the production of war goods in factories all over the country, are saving precious time, material and labor in the shop.

These standard jigs and adapters are easily and quickly set up—instantly ready to work on any particular part. The simple, material saving adapters are easy to make in your own toolroom in as great a variety as there are jobs.

It will pay you, in increased production, to investigate now the many advantages of Siewek Rapid Clamping Drill Jigs. Contact a Siewek representative in your territory, or write us. *Send for Catalog No. 50J.*

Affiliated with Siewek Engineering Division, a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing, Fabricating and Efficiency Methods

SIEWEK TOOL DIVISION
of Domestic Industries, Inc.
Detroit (Ferndale Station) Mich.
Representatives in Principal Cities

Manufacturers of
PROGRESSIVE SHEAR-CUT END MILLS

NOW READY!

B&G JUNIOR QUENCHER

For the first time, a completely self-contained unit for CONTROLLED QUENCHING in laboratories and tool and die shops . . . ideal for small-piece, custom heat-treating operations.

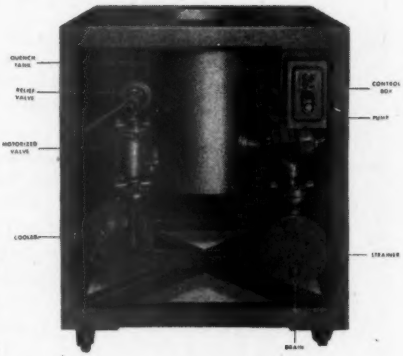
Ends the errors and uncertain results of improperly controlled quenching.

This complete, amazingly compact quench system combines Quench Tank with Cooler, Pump, Strainer and all control equipment. No storage tank is necessary—enough liquid is contained in the system to handle the quenching volume.

All the factors involved in the proper quenching of heat-treated metals are effectively coordinated by the B & G Junior Quencher. The quenching liquid is pumped into the Quench Tank through several openings around the lower perimeter. These opposing jets set up a *uniformly turbulent* flow from the bottom to the top of the Tank, where the liquid spills over into the overflow chamber.

The quenching liquid then passes through the Strainer into the Cooler, where it is cooled by city water flowing through copper tubes. Flow of the water is controlled by a Motorized Valve, which opens and closes to admit more or less water to the Cooler as required. The temperature of the quenching liquid is thus kept within a controlled range.

The B & G Junior Quencher truly fills a neglected need in smaller heat-treating operations.



SEND FOR THIS BOOKLET

Complete description and capacity data on the B & G Junior Quencher are contained in this new booklet, sent to you upon request.

B&G RAPID QUENCHING SYSTEMS

HEAT-TREATING EQUIPMENT SINCE 1916

BELL & GOSSETT COMPANY • MORTON GROVE, ILL.

For *Precision* Surface Grinding . . .

3 NORTON MACHINES

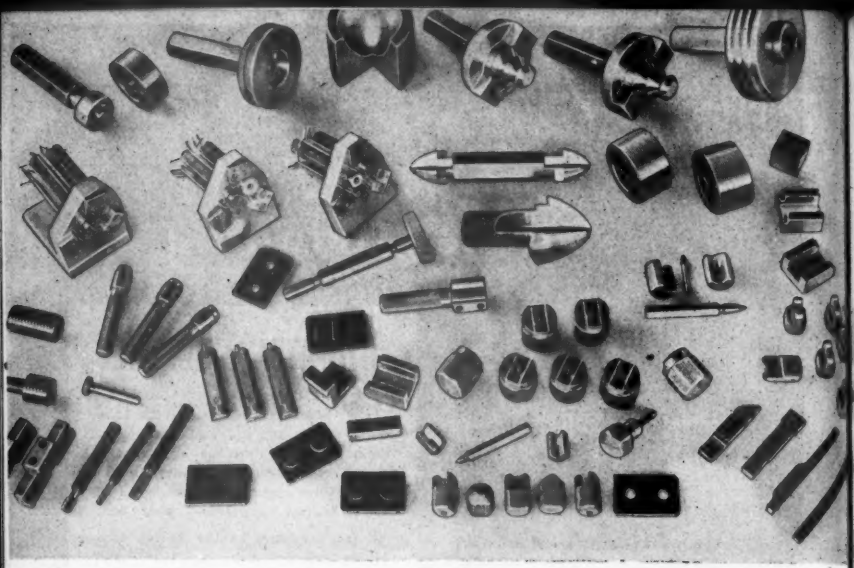
WHERE surface finish and dimensional accuracy must be better than average and production must be maintained at high levels, the Norton Surface Grinder fulfills the requirements of accuracy, and provides fast, convenient operation.

All the machines in the Norton line of Surface Grinders—in 6", 10" and 12" capacities—are precision-built for precision work. There is no sacrifice of stamina, however, and these surface grinders have an enviable record of long-lived, high-production accuracy.

Hydraulic operation is featured, with controls concentrated for operator convenience. Hand feeds supplement smooth power movement.

NORTON COMPANY
WORCESTER 6, MASS.

M-483



PRECISION GAGES produced by skilled craftsmen assuring the finest work to meet the most rigid specifications. Our modern facilities are among the best. A complete, air-conditioned inspection laboratory enables us to build special tools and gages to your specifications, exactly. Our 24 years of experience can save you time and costly errors. Send blue prints for immediate quotation and delivery schedule.

JIGS AND FIXTURES are a specialty. Reasonably prompt deliveries can be made to firms with high priorities. Work up to 24" can be made with precision accuracy. Our experienced toolmakers with an Army-Navy "E" reputation can solve your tooling problem.

THREAD GRINDING facilities are available to manufacturers with war orders. Accurate machines and precision inspection equipment are used to assure highest quality work. Write or wire today for delivery dates.

BUILDERS OF PRECISION TOOLS — GAGES • • JIGS • • FIXTURES

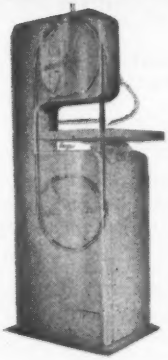
TOOLS and GAGES

INCORPORATED

3112 EAST 63rd STREET • CLEVELAND 4, OHIO

MICHIGAN 7230

That's right! 7¼ man hours were saved on each Pierce Punching Die for a large aircraft manufacturer. This die is made of plow steel and measures 16 x 15 x 3/16". A ½" flat DoALL File Band was used for the straight surfaces, a ½" oval file for the large radii.



This new DoALL Band Filer is 9 times faster than hand filing—4 times faster than jig filing. Gives you smooth, steady, one-way filing, without back stroking. Saves time, metal and file bands.

Strong support holds file band firm and means more even cutting. Speed-master equipped for variable speed, 50 to 250 f.p.m.

Operators like the roomy, tilting work table and the air jet which keeps it free from dust and chips. Weighs 485 pounds. Occupies only 27 x 34" floor space. Available on M.R.O. priority.

DoALL FILE BANDS

Ready to prove their worth. 12 standard styles to file different kinds of metals, alloys, laminates, plastics. Made to fit the new DoALL Filer or any model DoAll Contour Machine.

Write for Illustrated Literature

DoALL INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.
1303 S. WASHINGTON AVE., MINNEAPOLIS 4, MINN.

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Rochester, Rockford, St. Louis, San Francisco, Seattle, Toledo, Tulsa, West Hartford

INVASION STRATEGY

Before a military officer can plan a strategic move he must be sure of having men and equipment.

Before a piece of equipment is approved a "pilot" model must be built with which to conduct tests.

Before a line to produce an approved model begins to roll, accurately engineered designs must be produced with which to guide the craftsmen who build the tools.

Experimental parts, tool designs and the actual tools that built many vital parts of our amazing fighting machine were produced "on the home front" right here at McKINNEY—*Cleveland.*

The exacting demands of war equipment were met with comparative ease because McKINNEY has been producing the highest calibre of tooling equipment for many years.

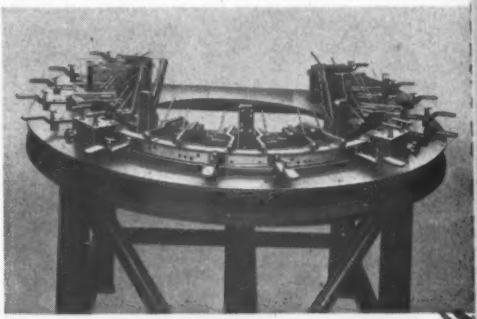
The knowledge gained in years of specialized service and the uncommon skill attained by our toolmakers in war production is now available to a few more companies and will be of great service to manufacturers during the transition and post war periods.

Let us send a bulletin explaining our facilities and equipment and phone or write us regarding any tooling problem with which you may be confronted.

BEGINS AT HOME

and AT McKINNEY ARE BORN···

Tools that "SPEARHEAD INVASIONS"



Jig for assembling the "nose" of a spectacular fighting plane.

McKinney features the finest inspection equipment and the most rigid inspection known to industry.

McKINNEY TOOL & MFG. CO.
CLEVELAND

DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920

1673 Arabella Road

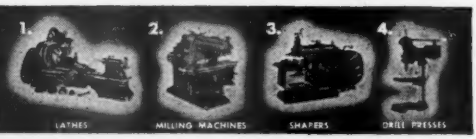
Tools·Dies·Jigs·Fixtures·Special Machinery

Atlas 10" LATHES

"...these machines are indispensable"

"While not as fast as automatics, *these machines* are *indispensable* on lots up to 1,000 pieces, and in some cases, we have run as many as 7,000 economically." This report of the Resistoflex Corporation, Belleville, N. J., is typical. Equipped with tailstock turret and other production attachments, Atlas lathes have such unexpected records on all types of screw machine work that many firms are counting heavily on compact Atlas tools in their reconversion plans. Send for latest catalogs. The Atlas Press Co., 812 N. Pitcher Street, Kalamazoo 13D, Mich.

4 Atlas TOOL TEAM FOR SMALL-PARTS MACHINING



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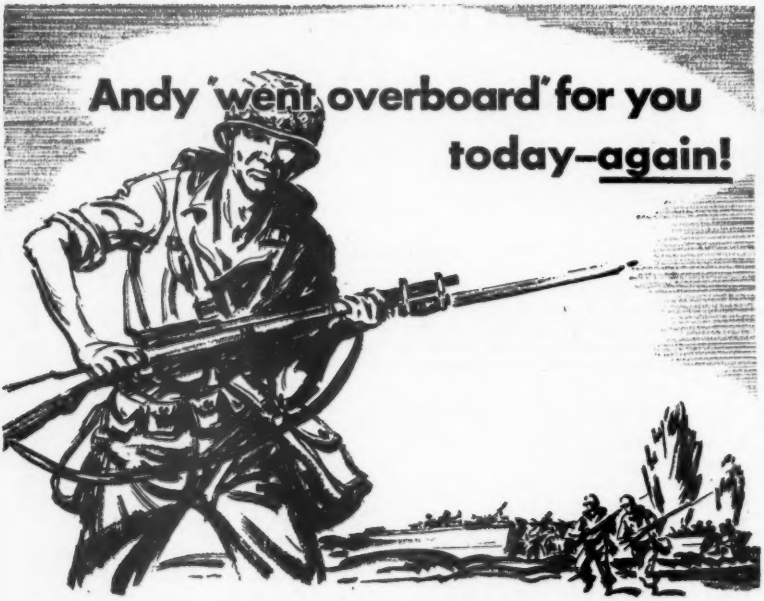
Coming in September

"Design of Plastics Parts and Molds," Part I—by Warren V. Prince
"Tap Selection"—by R. R. Williams
"Materials Weight Tables," Part V—by Geo. H. Thompson
"Three-Dimensional Drawings"—by L. S. Sanders
"Production and Operation of Plastic Tooling"—by Harold Clark
"Single Blade Reamers"—by Albert W. Ehlers
"Tool Room Surface Grinding," Part II—by J. E. Corbett
"Estimating Plastics Molds," Part II—by Gordon B. Thayer

Andy 'went overboard' for you today—again!



SOMEWHERE out there early this morning Andy and his gang went overboard in a surprise attack that will make history. That recalls other days when as salesman for your Industrial Supply Distributor◆ Andy used to "go overboard" regularly to help locate the hard-to-get materials you had to have to keep turning out war stuff on schedule.

Overseas training is helping to qualify Andy for a better job with your Industrial Supply Distributor, come peace. Meanwhile please remember that because his organization has devoted years to preparation for the peak demands of Industry, your Distributor has earned the opportunity to help you keep your present war production up to schedule.

Your Distributor can furnish everything you need in equipment, materials, supplies. Make him your central source instead of ordering from the factory and you will save manpower and time, reduce paper work and expedite your deliveries.

Till Andy comes home—and from then on—

Telephone your ◆C◆ FIRST!

ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

"CLEVELAND DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU"

MEN IN THE NEWS

Charles Sorenson resigns the Vice-Presidency of the Ford Motor Company and is elected President of Willys-Overland.

Henry Ford announces that he sees no necessity for a 20 to 30 percent advance in automobile prices, and permits announcement of a model in the $500.00 class.

The Fisher brothers retire from managerial activity in General Motors, to re-enter business on their own account.

From these events industry and business will draw reassurance, because without exception these "Men in the News" exemplify American Free Enterprise.

It is only forty years ago that Charles Sorenson applied to Henry Ford for a job as a patternmaker. It is recorded that Mr. Ford himself considered his new automobile business of such a precarious nature that he didn't feel justified in permitting young Charles to become an employee. Nevertheless, several months of persistence and his willingness to take the chance brought Charles into the Ford Motor Company. Throughout his advancement from one department to another, from foreman to superintendent, to General Superintendent, to Vice-president, and finally in July, 1941, to Director of the Corporation, Charles Sorenson maintained his interest in foundry practices, to the extent that he has become one of America's leading exponents of and authorities on steel casting. Research and development of this process under his direction brought frequent part and product improvement and immeasurably benefited and facilitated the war production program.

Today Mr. Sorenson, as head of Willys-Overland undoubtedly sees an opportunity to turn his experience more directly to his own profit. By so doing he gives a healthy stir to competition, because he will undoubtedly convert the Army's versatile Jeep, for the development of which much of the credit must go to Willys-Overland, into an economical small car acceptable to prospective buyers.

If, under Mr. Sorenson's direction, Willys-Overland becomes a more important factor in small car production, far reaching benefits can accrue to the Nation, and without injury to the other automobile industry members, because 14,000,000 to 15,000,000 cars in three years is a volume which should provide profitable operation for more manufacturers.

True to American industrial tradition, Mr. Ford accepts the challenge to his position in the American small car field, and permits announcement of a car in the $500.00 class, to be designed around his former Model A, a 4-cylinder engine model.

In his generation, Henry Ford probably is the outstanding example of what a man with an idea can accomplish under our system of Free Enterprise. Without benefit of patent control or capitalistic

monopoly, he has built, in not much over forty years, an industrial organization which is international in its scope and activities. In his industrial lifetime, Mr. Ford has upset the doctrine that "excluding" and "exclusive" are necessary for profitable business operation, and he has actually proved his theory that greater benefits come to a business from paying its labor higher wages. There was a time when many of Mr. Ford's contemporaries didn't take kindly to his theory that great industrial development can and does come from advancing wages and salaries to enable an ever-increasing number of families to acquire the products of industry. It was even less orthodox to reduce product prices to unlock the doors for those on lesser income levels.

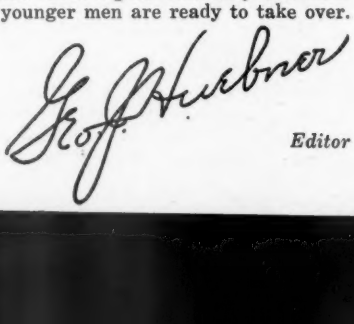
The entire automotive industry is typically American Free Enterprise. It is hardly necessary to remind ourselves that its cars and trucks have become not only our most popular nation-wide mode of transportation, but they have also provided us with transportation on the economic highway leading out of depression.

Surely it is reassuring to have the Fisher brothers announce their intention to re-enter business on their own. Here is another typically Free Enterprise family.

Just 43 years ago, Fred and Charles Fisher established the first plant of the Fisher Body Company in Detroit. They and their five younger brothers were the sons of Lawrence Fisher, who had the reputation of building fine carriages in Norwalk, Ohio. The elder sons had learned their trade from him, and gradually all of them became a part of the organization. Development of the company was so rapid that eighteen years later, in 1919, the General Motors Corporation was willing to acquire a majority interest for $27,600,000.00. In June, 1926, all assets were acquired, and several of the Fisher brothers became directors and executives of the General Motors Corporation, retaining their specific managerial direction of the Fisher Body Division. Now they relinquish this to get back into independent business immediately. Speculation arises as to the line of business, because that is not announced, but it seems logical that their interest would continue in the automotive industry, with its interesting postwar possibilities. General Motors Fisher Body Division plants are deep in the production of airplanes and aircraft parts and assemblies. Likewise are the independent body builders, Briggs and Murray. If transportation continues such a problem, Budd in Philadelphia would not seem to promise much help for the automobile manufactures in the Middle-west. Should there be new body-building facilities? If so, the Fisher brothers will recognize the need and the opportunity.

Our attempt at writing this bit of biographical history has just one purpose—to prove that opportunity is great under our system of Free Enterprise. When our men return from the wars, they will want to see evidence of it. The developments in the automobile industry which we have described will bring such opportunities. Competition always stimulates action. It places a premium on *ideas*. It encourages research, development, new designs and more efficient production.

Some students of our industrial life believe they see evidence of many forthcoming personnel changes. Older men have carried the burden of war production management. It is logical that they will hand over responsibility as rapidly as younger men are ready to take over.



Editor

TOOL ROOM SURFACE GRINDING

by J. E. Corbett

Flat Surfaces

A surface grinder operator's ability can be measured somewhat by the precision he obtains and the time he consumes in attaining a flat surface. Here it is assumed that efficient grinding implies both positive set-ups and removal of the necessary material in definitely planned steps. "Sparking-out" a job is not good practice for it serves no useful purpose; it belongs, along with many other practices, to the past. In other words, the operator should know or learn the character of the various available wheels as influenced by abrasives, grits, and grades; he should feel or know the condition of his machine; and above all, he must be able to recognize the elements or forces which act upon his work and influence his results. With this knowledge and appreciation, he can set up his jobs and obtain the maximum precision with the least effort.

In order to develop flat surfaces by grinding, it is necessary to understand the causes of warping and to know how to eliminate or reduce it. The principal causes of warped grinding are:

1. Changing strains within the part as stock is removed from its surface.
2. Surface expansion or contraction caused by localized heating or cooling as the part is being ground.

Internal Strains

The first cause of warping is also a heat treating problem, for many of the internal strains can be prevented or relieved in that operation. However, it is practically impossible to have cold steel in a strain free condition, so the grinder operator must accept this and handle the work accordingly. When a piece of steel assumes the shape shown in Fig. 1 it means that it became distorted during the equalizing or balancing of its internal strains.

As a piece of steel is quenched in hardening, its shell, or outer surface, cools quickly and contracts. This also compresses the core; in fact, the chilled shell "hot upsets" the inner metal which has not yet cooled. As the core cools, it, in turn, contracts and puts the shell under compression. If the piece were not quenched straight and uniformly on both sides, the side CD which may have cooled faster and hardened deeper will offer greater resistance to compression.

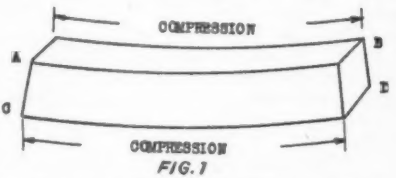


FIG. 1

Fig. 1 — Deformation resulting from locked up strains after quenching.

(Only air quenching steels harden clear through and their nondeforming properties are due to the more uniform cooling rates of the shell and core.) This inequality of resistance to compression causes the piece to warp until the compressive forces on AB and CD are in balance. Any interference with this balance will cause the piece to change shape until the forces again become equalized. For example, if a layer is ground from CD it will mean that CD now has less body and can offer less resistance to compression; hence the piece will straighten slightly. An additional layer ground from AB will cause the specimen to bow still more for the same reason. Fortunately for grinder operators, these strains tend to be concentrated in the surface areas where much of their force can be removed.

Because these cooling strains are al-

ways present to some degree it is necessary to rough grind a job all over before finishing any one surface. This practice is based on the theory that the outer shell contains the greater strains; and, while roughing off .010" to .030" from a surface may substantially disturb the balance, the finishing cuts of .001" to .002" will have no significant effect.

Therefore, in deference to stresses within the metal, the first rule of precision grinding is: "Rough grind the job all over before finishing any one surface."

Only practice and close observation will show the amount of stock which must be allowed for the finishing operation. In general, thin pieces are more troublesome than thicker ones; long pieces warp more than shorter ones; some steels are more difficult to grind and will develop more heat than others; and, of course, some operators need more stock for protection than is required by the more experienced hands.

Heat Distortion

The second cause of warping is both harder to analyze and more difficult to control. It is caused by localized or unequal heating and the effects are rather complex. Localized heating is caused by:

1. Grinding.
2. Application of a coolant appreciably above or below room temperature.
3. Heat from an electro-magnetic chuck.
4. Working on pieces which are either much warmer or cooler than room temperature.

To analyze the effect of heat generated by grinding, put a piece of steel 5" x 1" x ¼" at 68° F flat on a non-heating chuck and instead of grinding it, run over it with a smooth buffing wheel until the top surface is 20° warmer or at 88° F. Assume also that when the top reaches 88° that the bottom is still 68°. Then the temperature difference is 20° between the top and bottom surfaces. Under these conditions the top will expand in length and width while the bottom will want to retain its original dimensions. As this occurs the specimen changes shape; it arches up and the distortion can be calculated. See Fig. 2.

First, the top, originally 5.0000" long, expands to 5.00005" at 88° F while the bottom remains at 5.0000". The radius becomes approximately 2500" and the piece arches .0013". Therefore, if in developing a 20° temperature differential between the top and bottom surfaces, a grinding wheel had been used, .0013" more stock would have been removed from the middle of the surface than from its ends, and on cooling, the top would have been concave by that amount.

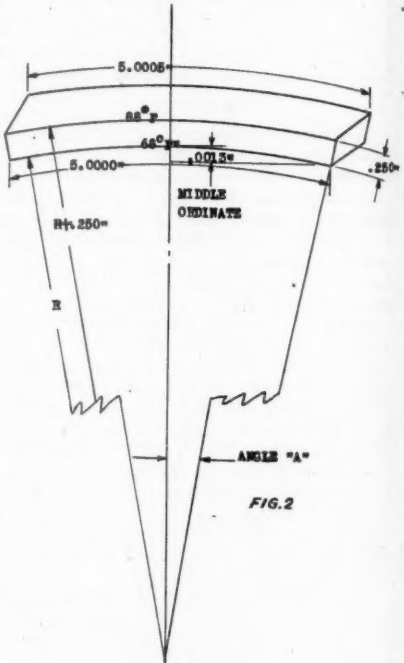


FIG. 2

Fig. 2—In radians, $A = \frac{2.5000}{R}$

also, $A = \frac{2.50025}{R+.250}$

therefore $\frac{2.5000"}{R} = \frac{2.50025}{R+.250}$

and $R = 2500$

hence MO (middle ordinate) = .0013, or .0013".

Temperature Control

With regard to localized heat distortion, the ideal conditions for precision grinding would include:

1. A room at 68° F.
2. A chuck at 68° F.
3. Coolant at 68° F.
4. Material at 68° F.
5. A non-heating wheel.

The first four of these conditions are obtainable but the last one is not. In fact, wheel generated heat is the principal barrier between an operator and perfection. This, of course, makes wheel selection and care an important matter and one to which the operator cannot give too much attention. While wheel selection is a subject for extensive study and experiment, space does permit the following outline of general rules:

1. A coarse wheel causes less heat than a fine wheel.
2. A soft wheel causes less heat than a hard wheel.
3. A narrow wheel causes less heat than a wide wheel.
4. An open wheel causes less heat than a dense wheel.
5. A sharp wheel causes less heat than a dull wheel.

Rule 3 means that a half inch wheel taking a cut .005" deep and .200" wide will generate less heat than a one inch wheel taking cuts of the same depth and width. This is because the thin wheel is "sparking out" over only the remaining .300" of its width while the one inch wheel would carry a follow up pass of .800".

Rule 4 refers to the concentration of grit, or a wheel's porosity.

These comments are not intended to suggest that an operator can always use the coarsest, softest, narrowest and most porous wheel obtainable, for other factors influence wheel selection. For example, coarseness is dictated by finish requirements; while the softness, width and density are controlled by other considerations such as the rate of production, the material being ground, the condition of the machine, the tolerances, the area of the surface being ground, and many others. Until an operator learns to allow for any unusual conditions he may be working under, he will do well to follow wheel manufacturers' general recommendations.

Summary

The principal purpose of this article was to establish this rule: The warmed side of a piece of stock (originally flat, parallel and of uniform temperature) will become convex and cause the piece to bow. If, in this condition, the warm side is then ground flat, it will certainly become depressed or concave as the temperature throughout the piece again becomes uniform. See Figs. 3 to 6.

Either cold coolant or a warm chuck will cause a reaction opposite from that

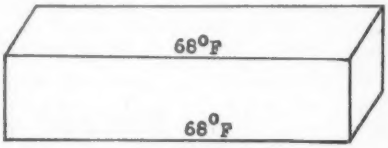


FIG. 3

Fig. 3 — Uniform temperature: Flat and Parallel.

outlined in Figs. 3 to 6. Under these conditions the ground surface will be convex when the temperature throughout the piece again becomes 68°.

It seemed necessary to show that thermal conditions actually change the shape of metal as well as its size, and to describe the nature of these forces which act according to well established principles, so that the operator can learn to anticipate the more common troubles and take steps to prevent them. Thus, if an operator is having trouble in developing flatness let him examine his procedure with the object of eliminating or reducing thermal distortion. In this connection, the popular thought is that a piece of steel admittedly will expand in length, width, or thickness but not enough to materially affect its size. If the piece shown in Fig. 2 were 88° throughout, that might be true, but unfortunately uniform heating does not

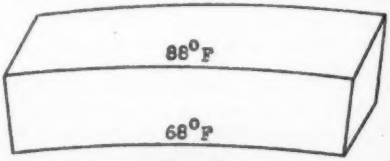


FIG. 4

Fig. 4 — Top, 88°F, Bottom 68°F: Bowed up.

occur and the result is distortion in a surprisingly substantial amount as shown.

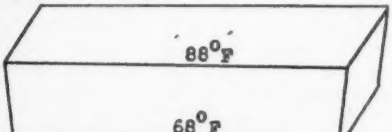


FIG. 5

Fig. 5—Bowed piece of Fig. 4 with top surface subsequently ground flat.

Consequently the best procedure, particularly in dry grinding, to avoid concave surfaces as the result either of internal strains or heat distortion, is to bring the piece back to normal temperature after roughing and before finishing by light cuts with a well dressed wheel.

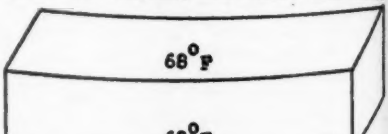


FIG. 6

Fig. 6—After attaining uniform temperature flat top of Fig. 5 has become concave and bowed bottom tends to flatten.

MATERIALS WEIGHT TABLES

The tables following on pages 94, 95, 96 and 97 comprise the fourth installment of the Materials Weight Tables.

The tables were originally calculated and compiled by Geo. H. Thompson, Treasurer, The Cleveland Metal Stamping Co., and have been in practical, everyday use for many years. Their working value has, therefore, been time tried and proved.

Designed to reduce to a minimum the work of calculating the total weight of steel (based on a steel of 1 cu. in. = .2836 lb.) required for a given press run, the tables are so basic as to be readily applicable for other materials and purposes.

Mr. Thompson's original tables were based on calculations carried to ten decimal places for extreme accuracy and involved multiplying the terms: *length* x *width* x .2836, a total of 36,864 times in covering all combinations of workpiece sizes from $\frac{1}{16}$" x $\frac{1}{16}$" to 12" x 12" in steps of $\frac{1}{16}$". Each page was devoted to one of the 192 dimensions prevailing from $\frac{1}{16}$" to 12" in steps of sixteenths, and each page carried the corresponding 192 constants for whatever the other coordinate dimension might be (also of from $\frac{1}{16}$" to 12" in steps of sixteenths).

The T & D J condensed version of Mr. Thompson's original tables reduces each of his pages to one column, or a total of 192 columns, headed by dimensions in increments of $\frac{1}{16}$", from $\frac{1}{16}$" to 12". Each of our columns in turn, carries the constants for 1" to 12" in steps of 1", and for $\frac{1}{16}$" to $\frac{15}{16}$" in steps of sixteenths; all told, a total of 27 constants per column.

Our condensed arrangement of 192 columns results in six columns per page and we are publishing 4 pages, or 24 columns, per monthly installment. Of the eight installments necessary to complete the tables, the accompanying pages comprise the fourth. We originally planned to make the entire series available as a 32-page reprint. Due, however, to the expressions of interest that we have had from those who can make good use of these tables in their daily job, we are endeavoring to bring out the 32-page edition of the table even before completion of the T & D J installments. Watch for further announcements.

The use of the tables is of the utmost simplicity. For instance, given a job that is to be blanked out of strip stock 5" wide, with a "pitch" or length of stock feed per blank of $8\frac{7}{16}$", and an assumed stock thickness of .036": In the column headed by $8\frac{7}{16}$" we find the constant 11964.40 opposite 5". Multiplying 11964.40 by .036 gives 430.7184 or 431, which is the weight in pounds for 1000 pieces 5" x $8\frac{7}{16}$" x .036".

Suppose, however, that the stock requirement was $5\frac{13}{16}$" x $8\frac{7}{16}$": In such a case, we refer to the same column headed by $8\frac{7}{16}$", and, to the constant given for 5" we add the constant shown for $\frac{13}{16}$", or 11964.40+1944.21 = 13908.61. This new constant multiplied by .036

gives 501 lbs. as the weight of 1000 pieces, $5\frac{11}{16}$" x $8\frac{7}{16}$" x .036".

Additionally, the tables will give the weight of a single piece of stock by moving the decimal point three places to the left. For instance to find the weight of a block of steel 8½" x 12" x 3", in the column headed by 8½" we find the constant 28927.20 opposite 12"; therefore by moving the constant's decimal point three places to the left (making it 28.9) and multiplying by 3 we get 86.7 as the weight in pound of a block of steel 8½" x 12" x 3". At this point it should be noted that the fastest use of the tables can be made by so choosing the constant that it may be multiplied by the simplest of the several factors. For instance in the example just given we could have used the constant given for 8½" x 3", or 7.23 (after moving the decimal point 3 places to the left). This multiplied by 12 gives a weight 86.76 lbs but is a more involved multiplication chore than in the first instance. In other words, 28.9 x 3 is a simpler multiplication than 7.23 x 12.

The examples given above have been for a steel of 1 cu. in. = .2836 lb upon which weight the tables were initially calculated.

The tables will serve for weight calculations of any material by multiplying the weight of the stock in steel by the appropriate conversion factor. For instance, in the example given for steel 5" x $8\frac{7}{16}$" x .036" weighing 431 lbs per 1000 pieces, multiplying the steel weight by 1.136 gives the stock weight requirement for the same job in sheet copper: 431 x 1.136 = 489.6 as the weight in pounds for 1000 pieces of copper 5" x $8\frac{7}{16}$" x .036.

The conversion factors for a variety of materials are as follows:

Aluminum, = steel weight x 0.344
Aluminum and Tin:
Al 91%, Sn 9%, = steel weight x 0.363
Aluminum and Zinc:
Al 91%, Zn 9%, = steel weight x 0.357
Brass:
Cu 90%, Zn 10%, = steel weight x 1.093
Cu 50%, Zn 50%, = steel weight x 1.043
Bronze:
Cu 80%, Sn 20%, = steel weight x 1.112
Tobin, average, = steel weight x 1.065
Copper, pure, = steel weight x 1.123
Copper, sheet, = steel weight x 1.136
Copper and Nickel:
Cu 60%, Ni 40%, = steel weight x 1.130
German Silver:
Cu 59%, Zn 30%, Ni 11%, = steel weight x 1.061
Glass, = steel weight x 0.331
Iron, cast, = steel weight x 0.918
Magnesium, = steel weight x 0.222
Manganese, Copper and Nickel:
Mn 12%, Cu 84%, Ni 4%, = steel weight x 1.081
Monel, = steel weight x 1.077
Nickel, = steel weight x 1.128
Platinum and Iridium:
Pt 90%, Iridium 10%, = steel weight x 2.750
Silver, = steel weight x 1.34
Tin, = steel weight x 0.931
Tungsten, = steel weight x 2.46
Zinc, = steel weight x 0.910

Even when worked entirely "by hand" the tables are a valuable time saver. However, for those who are used to working entirely with and depending upon a slide rule, the tables still serve as a shortcut. A given constant multiplied arithmetically by the stock thickness in thousandths is appreciably faster than running through the slide rule settings for *length* x *width* x *thickness* x *weight*, and, at the same time, more accurate, which is most important as we deal in greater quantities. Nevertheless, the speed and convenience of manipulating only one setting of the slide rule to *constant* x *thickness* permits a double check for accuracy and is still a time saver.

Stock requirement calculations based on conventional tables of gauge weight per square foot do not facilitate taking into consideration the weight variable occasioned by the stock thickness tolerance. In contrast to this, compare the ease with which our tables may be employed to determine the range in weight due to thickness variations. In the case of a stock thickness of .050", plus or minus .005", by the quick multiplication of the constant by, first, .045 and second by .055 we accurately arrive at the high and low limits.

In conclusion, the combined accuracy and facility of these tables is such as to permit the calculation of stock requirements with the assurance that variables are reduced to a minimum.

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement) — PART IV[3]

Calculated and Compiled by Geo. H. Thompson

	8 5/16" x		8 3/8" x		8 7/16" x		8 1/2" x		8 9/16" x		8 5/8" x
1"	2357.43	1"	2375.15	1"	2392.88	1"	2410.60	1"	2428.33	1"	2446.05
2"	4714.85	2"	4750.30	2"	4785.75	2"	4821.20	2"	4856.65	2"	4892.10
3"	7072.28	3"	7125.45	3"	7178.63	3"	7231.80	3"	7284.98	3"	7338.15
4"	9429.70	4"	9500.60	4"	9571.50	4"	9642.40	4"	9713.30	4"	9784.20
5"	11787.10	5"	11875.80	5"	11964.40	5"	12053.00	5"	12141.60	5"	12230.30
6"	14144.60	6"	14250.90	6"	14357.30	6"	14463.60	6"	14570.00	6"	14676.30
7"	16502.00	7"	16626.10	7"	16750.10	7"	16874.20	7"	16998.30	7"	17122.40
8"	18859.40	8"	19001.20	8"	19143.00	8"	19284.80	8"	19426.60	8"	19568.40
9"	21216.80	9"	21376.40	9"	21535.90	9"	21695.40	9"	21854.90	9"	22014.50
10"	23574.30	10"	23751.50	10"	23928.80	10"	24106.00	10"	24283.30	10"	24460.50
11"	25931.70	11"	26126.70	11"	26321.60	11"	26516.60	11"	26711.60	11"	26906.60
12"	28289.10	12"	28501.80	12"	28714.50	12"	28927.20	12"	29139.90	12"	29352.60
1/16"	147.34	1/16"	148.45	1/16"	149.55	1/16"	150.66	1/16"	151.77	1/16"	152.88
1/8"	294.68	1/8"	296.89	1/8"	299.11	1/8"	301.33	1/8"	303.54	1/8"	305.76
3/16"	442.02	3/16"	445.34	3/16"	448.66	3/16"	451.99	3/16"	455.32	3/16"	458.64
1/4"	589.36	1/4"	593.79	1/4"	598.22	1/4"	602.65	1/4"	607.08	1/4"	611.51
5/16"	736.70	5/16"	742.23	5/16"	747.77	5/16"	753.31	5/16"	758.85	5/16"	764.39
3/8"	884.03	3/8"	890.68	3/8"	897.33	3/8"	903.98	3/8"	910.62	3/8"	917.27
7/16"	1031.37	7/16"	1039.13	7/16"	1046.88	7/16"	1054.64	7/16"	1062.39	7/16"	1070.15
1/2"	1178.71	1/2"	1187.58	1/2"	1196.44	1/2"	1205.30	1/2"	1214.16	1/2"	1223.03
9/16"	1326.05	9/16"	1336.02	9/16"	1345.99	9/16"	1355.96	9/16"	1365.93	9/16"	1375.90
5/8"	1473.39	5/8"	1484.47	5/8"	1495.55	5/8"	1506.63	5/8"	1517.70	5/8"	1528.78
11/16"	1620.73	11/16"	1632.92	11/16"	1645.10	11/16"	1657.29	11/16"	1669.47	11/16"	1681.66
3/4"	1768.07	3/4"	1781.36	3/4"	1794.66	3/4"	1807.95	3/4"	1821.24	3/4"	1834.54
13/16"	1915.41	13/16"	1929.81	13/16"	1944.21	13/16"	1958.61	13/16"	1973.01	13/16"	1987.42
7/8"	2062.75	7/8"	2078.26	7/8"	2093.77	7/8"	2109.28	7/8"	2124.78	7/8"	2140.29
15/16"	2210.09	15/16"	2226.70	15/16"	2243.32	15/16"	2259.94	15/16"	2276.55	15/16"	2293.17

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

[3]Part I, Tool & Die Journal, May 1944
Part II, Tool & Die Journal, June 1944
Part III, Tool & Die Journal, July 1944

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	8 11/16" x		8 3/4" x		8 13/16" x		8 7/8" x		8 15/16" x		9"	
1"	2463.78	1"	2481.50	1"	2499.23	1"	2516.95	1"	2534.68	1"	2552.40
2"	4927.55	2"	4963.00	2"	4998.45	2"	5033.90	2"	5069.35	2"	5104.80
3"	7391.33	3"	7444.50	3"	7497.68	3"	7550.85	3"	7604.03	3"	7657.20
4"	9855.10	4"	9926.00	4"	9996.90	4"	10067.80	4"	10138.70	4"	10209.60
5"	12318.90	5"	12407.50	5"	12496.10	5"	12584.80	5"	12673.40	5"	12762.00
6"	14782.70	6"	14889.00	6"	14995.40	6"	15101.70	6"	15208.10	6"	15314.40
7"	17246.40	7"	17370.50	7"	17494.60	7"	17618.70	7"	17742.70	7"	17866.80
8"	19710.20	8"	19852.00	8"	19993.80	8"	20135.60	8"	20277.40	8"	20419.20
9"	22174.00	9"	22333.50	9"	22493.00	9"	22652.60	9"	22812.10	9"	22971.60
10"	24637.80	10"	24815.00	10"	24992.30	10"	25169.50	10"	25346.80	10"	25524.00
11"	27101.50	11"	27296.50	11"	27491.50	11"	27686.50	11"	27881.40	11"	28076.40
12"	29565.30	12"	29778.00	12"	29990.70	12"	30203.40	12"	30416.10	12"	30628.80
1/16"	153.99	1/16"	155.09	1/16"	156.20	1/16"	157.31	1/16"	158.42	1/16"	159.53
1/8"	307.97	1/8"	310.19	1/8"	312.40	1/8"	314.62	1/8"	316.83	1/8"	319.05
3/16"	461.96	3/16"	465.28	3/16"	468.60	3/16"	471.93	3/16"	475.25	3/16"	478.58
1/4"	615.94	1/4"	620.38	1/4"	624.81	1/4"	629.24	1/4"	633.67	1/4"	638.10
5/16"	769.93	5/16"	775.47	5/16"	781.01	5/16"	786.55	5/16"	792.09	5/16"	797.63
3/8"	923.92	3/8"	930.56	3/8"	937.21	3/8"	943.86	3/8"	950.50	3/8"	957.15
7/16"	1077.90	7/16"	1085.66	7/16"	1093.41	7/16"	1101.17	7/16"	1108.92	7/16"	1116.68
1/2"	1231.89	1/2"	1240.75	1/2"	1249.61	1/2"	1258.48	1/2"	1267.34	1/2"	1276.20
9/16"	1385.87	9/16"	1395.84	9/16"	1405.81	9/16"	1415.78	9/16"	1425.75	9/16"	1435.73
5/8"	1539.86	5/8"	1550.94	5/8"	1562.02	5/8"	1573.09	5/8"	1584.17	5/8"	1595.25
11/16"	1693.85	11/16"	1706.03	11/16"	1718.22	11/16"	1730.40	11/16"	1742.59	11/16"	1754.78
3/4"	1847.83	3/4"	1861.13	3/4"	1874.42	3/4"	1887.71	3/4"	1901.01	3/4"	1914.30
13/16"	2001.82	13/16"	2016.22	13/16"	2030.62	13/16"	2045.02	13/16"	2059.42	13/16"	2073.83
7/8"	2155.80	7/8"	2171.31	7/8"	2186.82	7/8"	2202.33	7/8"	2217.84	7/8"	2233.35
15/16"	2309.79	15/16"	2326.41	15/16"	2343.02	15/16"	2359.64	15/16"	2376.26	15/16"	2392.88

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	9 1/16" x		9 1/8" x		9 3/16" x		9 1/4" x		9 5/16" x		9 3/8" x
1"	2570.13	1"	2587.85	1"	2605.58	1"	2623.30	1"	2641.03	1"	2658.75
2"	5140.25	2"	5175.70	2"	5211.15	2"	5246.60	2"	5282.05	2"	5317.50
3"	7710.38	3"	7763.55	3"	7816.73	3"	7869.90	3"	7923.08	3"	7976.25
4"	10280.50	4"	10351.40	4"	10422.30	4"	10493.20	4"	10564.10	4"	10635.00
5"	12850.60	5"	12939.30	5"	13027.90	5"	13116.50	5"	13205.10	5"	13293.80
6"	15420.80	6"	15527.10	6"	15633.50	6"	15739.80	6"	15846.20	6"	15952.50
7"	17990.90	7"	18115.00	7"	18239.00	7"	18363.10	7"	18487.20	7"	18611.30
8"	20561.00	8"	20702.80	8"	20844.60	8"	20986.40	8"	21128.20	8"	21270.00
9"	23131.10	9"	23290.70	9"	23450.20	9"	23609.70	9"	23769.20	9"	23928.80
10"	25701.30	10"	25878.50	10"	26055.80	10"	26233.00	10"	26410.30	10"	26587.50
11"	28271.40	11"	28466.40	11"	28661.30	11"	28856.30	11"	29051.30	11"	29246.30
12"	30841.50	12"	31054.20	12"	31266.90	12"	31479.60	12"	31692.30	12"	31905.00
1/16"	160.64	1/16"	161.75	1/16"	162.85	1/16"	163.96	1/16"	165.07	1/16"	166.18
1/8"	321.27	1/8"	323.48	1/8"	325.70	1/8"	327.91	1/8"	330.13	1/8"	332.34
3/16"	481.90	3/16"	485.22	3/16"	488.55	3/16"	491.87	3/16"	495.20	3/16"	498.52
1/4"	642.53	1/4"	646.96	1/4"	651.39	1/4"	655.83	1/4"	660.26	1/4"	664.69
5/16"	803.16	5/16"	808.70	5/16"	814.24	5/16"	819.78	5/16"	825.32	5/16"	830.86
3/8"	963.80	3/8"	970.44	3/8"	977.09	3/8"	983.74	3/8"	990.38	3/8"	997.03
7/16"	1124.43	7/16"	1132.18	7/16"	1139.94	7/16"	1147.69	7/16"	1155.45	7/16"	1163.20
1/2"	1285.07	1/2"	1293.93	1/2"	1302.79	1/2"	1311.65	1/2"	1320.51	1/2"	1329.38
9/16"	1445.70	9/16"	1455.67	9/16"	1465.64	9/16"	1475.61	9/16"	1485.58	9/16"	1495.55
5/8"	1606.33	5/8"	1617.41	5/8"	1628.48	5/8"	1639.56	5/8"	1650.64	5/8"	1661.72
11/16"	1766.96	11/16"	1779.15	11/16"	1791.33	11/16"	1803.52	11/16"	1815.70	11/16"	1827.89
3/4"	1927.59	3/4"	1940.89	3/4"	1954.18	3/4"	1967.48	3/4"	1980.77	3/4"	1994.06
13/16"	2088.23	13/16"	2102.63	13/16"	2117.03	13/16"	2131.43	13/16"	2145.83	13/16"	2160.23
7/8"	2248.86	7/8"	2264.37	7/8"	2279.88	7/8"	2295.39	7/8"	2310.90	7/8"	2326.41
15/16"	2409.49	15/16"	2426.11	15/16"	2442.73	15/16"	2459.34	15/16"	2475.96	15/16"	2492.58

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	9 7/16" x		9 1/2" x		9 9/16" x		9 5/8" x		9 11/16" x		9 3/4" x
1"	2676.48	1"	2694.20	1"	2711.93	1"	2729.65	1"	2747.38	1"	2765.10
2"	5352.95	2"	5388.40	2"	5423.85	2"	5459.30	2"	5494.75	2"	5530.20
3"	8029.43	3"	8082.60	3"	8135.78	3"	8188.95	3"	8242.13	3"	8295.30
4"	10705.90	4"	10776.80	4"	10847.70	4"	10918.60	4"	10989.50	4"	11060.40
5"	13382.40	5"	13471.00	5"	13559.60	5"	13648.30	5"	13736.90	5"	13825.50
6"	16058.90	6"	16165.20	6"	16271.60	6"	16377.90	6"	16484.30	6"	16590.60
7"	18735.30	7"	18859.40	7"	18983.50	7"	19107.60	7"	19231.60	7"	19355.70
8"	21411.80	8"	21553.60	8"	21695.40	8"	21837.20	8"	21979.00	8"	22120.80
9"	24088.30	9"	24247.80	9"	24407.30	9"	24566.90	9"	24726.40	9"	24885.90
10"	26764.80	10"	26942.00	10"	27119.30	10"	27296.50	10"	27473.80	10"	27651.00
11"	29441.20	11"	29636.20	11"	29831.20	11"	30026.20	11"	30221.10	11"	30416.10
12"	32117.70	12"	32330.40	12"	32543.10	12"	32755.80	12"	32968.50	12"	33181.20
1/16"	167.28	1/16"	168.39	1/16"	169.50	1/16"	170.61	1/16"	171.72	1/16"	172.82
1/8"	334.56	1/8"	336.78	1/8"	338.99	1/8"	341.21	1/8"	343.42	1/8"	345.64
3/16"	501.84	3/16"	505.16	3/16"	508.49	3/16"	511.81	3/16"	515.14	3/16"	518.46
1/4"	669.12	1/4"	673.55	1/4"	677.98	1/4"	682.41	1/4"	686.84	1/4"	691.28
5/16"	836.40	5/16"	841.94	5/16"	847.48	5/16"	853.02	5/16"	858.56	5/16"	864.09
3/8"	1003.68	3/8"	1010.33	3/8"	1016.97	3/8"	1023.62	3/8"	1030.27	3/8"	1036.91
7/16"	1170.96	7/16"	1178.71	7/16"	1186.47	7/16"	1194.22	7/16"	1201.98	7/16"	1209.73
1/2"	1338.24	1/2"	1347.10	1/2"	1355.96	1/2"	1364.83	1/2"	1373.69	1/2"	1382.55
9/16"	1505.52	9/16"	1515.49	9/16"	1525.46	9/16"	1535.43	9/16"	1545.40	9/16"	1555.37
5/8"	1672.80	5/8"	1683.88	5/8"	1694.95	5/8"	1706.03	5/8"	1717.11	5/8"	1728.19
11/16"	1840.08	11/16"	1852.26	11/16"	1864.45	11/16"	1876.63	11/16"	1888.82	11/16"	1901.01
3/4"	2007.36	3/4"	2020.65	3/4"	2033.94	3/4"	2047.24	3/4"	2060.53	3/4"	2073.83
13/16"	2174.64	13/16"	2189.04	13/16"	2203.44	13/16"	2217.84	13/16"	2232.24	13/16"	2246.64
7/8"	2341.92	7/8"	2357.43	7/8"	2372.93	7/8"	2388.44	7/8"	2403.95	7/8"	2419.46
15/16"	2509.20	15/16"	2525.81	15/16"	2542.43	15/16"	2559.05	15/16"	2575.66	15/16"	2592.28

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MODERN DESIGNS FOR DRILLING JIGS AND TAPPING FIXTURES

High Speed Precision Tapping

High speed tapping and clean cut precision threads can be attained only by using good fixtures, ground thread taps, the right lubricant, and modern precision machines.

C. W. Hinman
Designing Engineer

High speed steel taps have become well established for general production use; manufacturers used to persistently avoid using them, because it was thought that they were too fragile. But the new sensitively controlled precision tapping machines successfully prevent excessive tap breakage. High speed steel taps have about the same cutting speed advantages as do drills and milling cutters of the same material.

It is essential to use an appropriate size of tapping machine for the job. For tapping small shallow holes in light work, use small, quick-acting, sensitive tapping machines, and use heavier machines for tapping deeper or larger holes in tough steel. This means that the size and capacity of the machine must be in proportion to the size and depth of holes to be tapped and the severity of the cutting operation.

The spindle of the tapping machine should have an easy running fit through the head bearing, and be permitted to slide up and down free of interference. The spindle should be checked for a 90° alignment to the plane of the work table. The tapping chuck and its reversing mechanism should be designed to act quickly and positively. The work holding fixture must be arranged to position each hole directly under the tap. The tapping spindle and chuck should be properly counterbalanced; a compressed air cylinder can be used for this purpose, otherwise adjustable tension springs and changeable counter weights are used. Unless the spindle is properly counterbalanced, the threads cut in the work may be distorted when the spindle reverses for backing out the tap.

The following six retapping operations are for steel parts. Retapping is for producing clean threads in the tapped holes of the part after a finishing composition has been applied. All the taps in these operations have commercial ground threads for cutting Class 3 threads.

Tapping a Gas Cylinder Lock for Rifles

The operation is shown in Fig. 175. The fixture holds the part by air pressure, the clamping cylinder is shown under the work, and is controlled automatically by the movements of the tap-

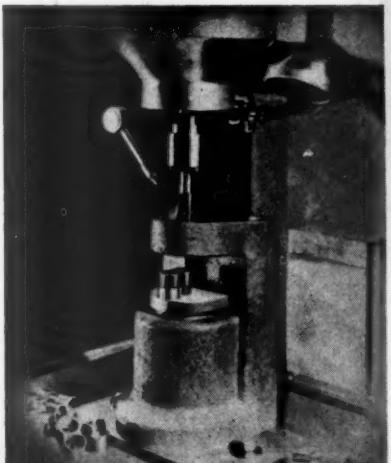


Fig. 175 — Tapping a Rifle Gas Cylinder Lock.

ping machine spindle. A positively attached stripper plate projects over the work. The tap size is $\frac{5}{16}$" —32, it has 4 flutes, and two of its entering threads are chamfered. The tapped hole is $\frac{1}{2}$" deep. The tapping speed "in" is 360 rpm, and 720 rpm for backing out the tap. Gross production: 400 pieces per hour, which is rather low because in retapping operations the finishing composition retards the work. The air pressure on the spindle is 17 lb. down, and 14 lb. in the up-stroke for counterbalancing.

Tapping Rear Sight Assemblies for Rifles

This part is composed of two units which are fitted together before bringing them to the machine. The tapping operation is shown in Fig. 176 at the

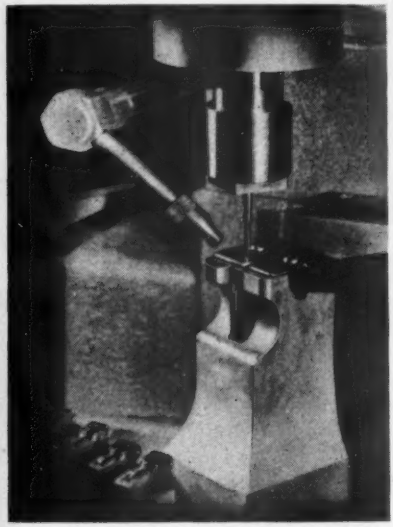


Fig. 176 — Tapping Rifle Rear Sight Assemblies.

middle left. The work is inserted in a post type of fixture under a stripper plate, and in a vertical rectangular slot to prevent its turning with the tap. The tap size is .130"—40 and it is a two fluted gun-tap. The tapped hole is .400" deep. The tapping rpm's are 770 "in", and 1540 rpm for backing out. Gross production: 400 pieces per hour, which is a low output because of the conditions due to retapping. The downward air pressure is 17 lb. on the spindle, and 14 lb. is used in the upstroke for counterbalancing.

Tapping an Ejector Stop for Rifles

This operation is seen in Fig. 177. The work is inserted in a post fixture

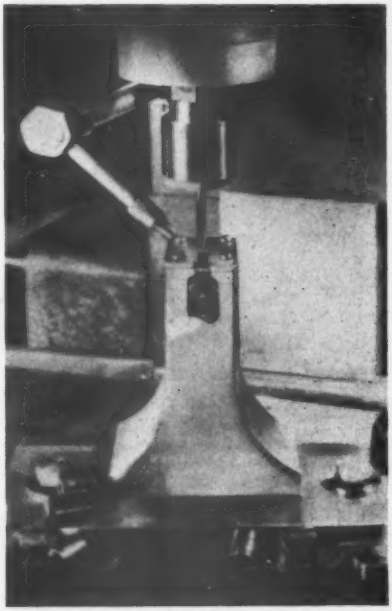


Fig. 177 — Tapping a Rifle Ejector Stop.

under a stripper plate and in a vertical rectangular slot that prevents its revolving with the tap. The tap size is .152" —32, and it is a two fluted gun-tap. The tapped hole is ¼" deep. The tapping speeds "in" and "out" are 770 and 1540 rpm respectively. Gross production: 1000 pieces per hour. Air pressure: 17 lb. down, and 14 lb. up.

Tapping a Rear Sight Base for Rifles

This operation is shown in Fig. 178. The work is inserted in a post type fixture under a stripper plate and in a horizontal slot. The tap size is $\frac{5}{16}$"—32 has 3 flutes and a pilot, and two threads are chamfered. The depth of the tapped hole is ⅜". Tapping speeds "in" and "out" are 770 and 1540 rpm respectively. Gross production: 950 pieces per hour. Air pressure 17 lb. down, and 14 lb. up.

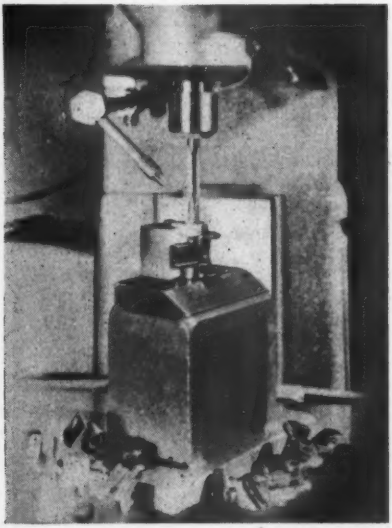


Fig. 178 — Tapping a Rifle Rear Sight Base.

Tapping a Gas Cylinder for Rifles

This tapping operation is illustrated in Fig. 179 at the middle right. The fixture is a vertical post type having a sliding base. The work is loaded in the slide when it is open, the slide is then pushed forward against a stop which aligns the hole in the work with the tap, and under a positive stripper plate. The tap size is $\frac{9}{16}$" —32, has 4 flutes and two of its entering threads are chamfered. The tapped hole is $\frac{11}{16}$" deep. The threading speed is 360 rpm "in" and 720 rpm "out". Gross production: 450 pieces per hour. Air pressure 18 lb. down, and 14 lb. up.

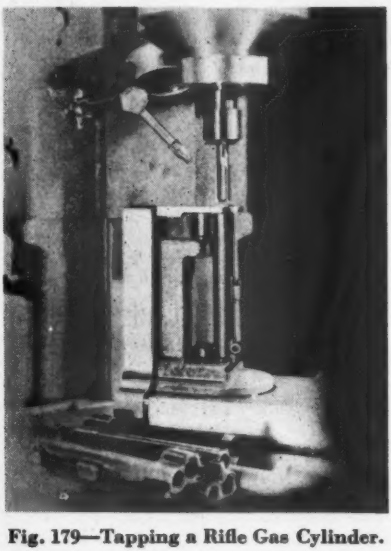


Fig. 179—Tapping a Rifle Gas Cylinder.

Tapping a Bolt Handle for Rifles

The tapping operation is illustrated in Fig. 180. The tap size is .218"—32 ic

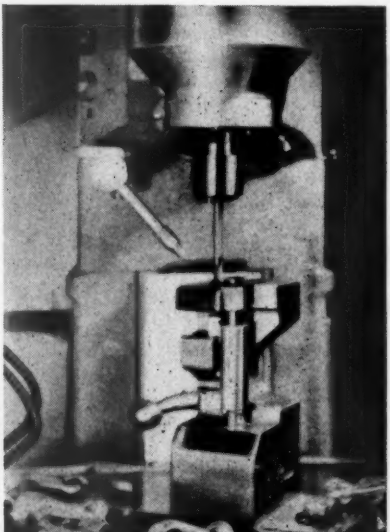


Fig. 180—Tapping a Rifle Bolt Handle.

Photos: Courtesy, R. G. Haskins Company

a 2-fluted gun-tap with an extra long shank. The tapped hole is $\frac{13}{16}$" deep. The threading speed is 770 rpm "in" and 1540 rpm "out". Gross production: 500 pieces per hour. Air pressure 17 lb. down and 14 lb. up.

High Speed Horizontal Tapping Machine

The special horizontal tapping machine shown in Fig. 181 is made up of a fixed head *A* and a shaft upon which the tapping chuck *B* is mounted. The

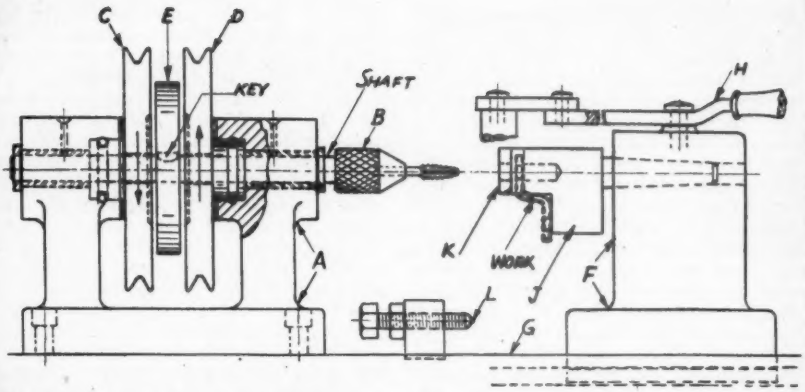


Fig. 181 — Special horizontal machine with a reversible spindle for the high speed tapping of large quantities of small work pieces. This is a simple low cost machine and can be built in any toolroom,

shaft as shown runs in bronze bearings but ball bearings would be an improvement. The protective housing is removed from the head to disclose the mechanism. Sheave pulleys *C* and *D* revolve upon the shaft freely, but friction disc *E* is positively "keyed" on the shaft. Pulley *C* revolves right handed for tapping "in", and pulley *D* revolves left handed (at double speed) for backing out the tap. These speeds and directions of rotation are obtained by using open and crossed belts from the drive, and *D* is driven by a pulley that is twice the diameter of the driving pulley for *C*. Post *F* slides in a guide on surface *G*, and can be reciprocated to and from *A* by means of the handle toggle-lever *H*. Tapping fixture *J* is secured in *F* by a tapered shank, as shown.

The work is usually small, angular or flat pieces needed in large quantities, such as: electrical connectors, clips, or terminals, which are inserted in the fixture from underneath, using the left hand for pushing them up against a stop. The work is held with the left hand, while the right hand controls handle *H*. The handle is pulled forward and advances the fixture and work toward the tapping head. When the point on the tap contacts the hole in the work, and *H* continues its advance, the drive shaft is pushed back until friction disc *E* engages sheave pulley *C*, which revolves the chuck and taps the hole. Lever *H* is then moved in the opposite direction, and disc *E* contacts pulley *D* causing the chuck to reverse instantly and to force the tap to back out at double speed. A hole in the fixture body clears the tap behind the work, and plate *K* "strips" the work from the tap when the fixture withdraws. After tapping, the work drops out of the fixture by gravity, and falls into a chute leading to a stock pan.

The stroke of the fixture is only about 1½", and the operator has another blank in his left hand ready to be inserted immediately after the tool is clear. There are cases where this equipment has tapped over 3,000 small pieces per hour. With a bushing inserted in plate *K*, this machine can also be used for drilling small holes in light work, and for burring, spot-centering, countersinking, or counterboring small parts in quantity production. An adjustable stop at *L* determines the cutting depth.

Vertical Tapping Machine

Figure 182 represents an efficient tapping machine that follows the same practical ideas for speedy operation, as the horizontal machine in the preceding description. Both of these machines can be "home made" in the shop, and are just as fast and easy to operate as others that cost ten times as much. They are excellent equipment for the small manufacturer who finds that he must get along someway without using expensive

tools and machines in producing large quantities of tapped parts.

In the sketch, the housing that ordinarily surrounds driving head *A* is removed to show the simple design and construction. The letters refer to the description of the foregoing sketch, and both machines are practically identical except that this one requires a steel plate or casting *M*, for the table and the vertical column. Counterweight *N* can be adjusted to balance the head, chuck and tap, and clearance bushing *O* can be exchanged for others to suit the different diameters of taps used. The fixture is clamped on the table as at *P*, with its entering hole directly under the tap. Sometimes this machine is designed with head *A* in a permanent position, the table is then arranged so that it can be elevated or lowered by attaching toggle-lever *H* and its counterweight to it; with the tapping fixture clamped on the table, it can be raised for "tapping in" and lowered for "tapping out".

Many small parts to be tapped can be fed into this machine and fixture through guide chutes. Larger machines for tapping heavier work have designs and constructions similar to these small machines, and the only difference is that larger machines use flat belts for driving, or double triangular belts, and leather lined friction cups in place of friction discs *E*. Both the friction discs and cups prevent excessive tap breakage by permitting a definite slip in the power applied to the tap when hard spots in the work are encountered by a dulled tap, or when an overstrain is put on the tap by attempting to cut threads in holes having too small diameters.

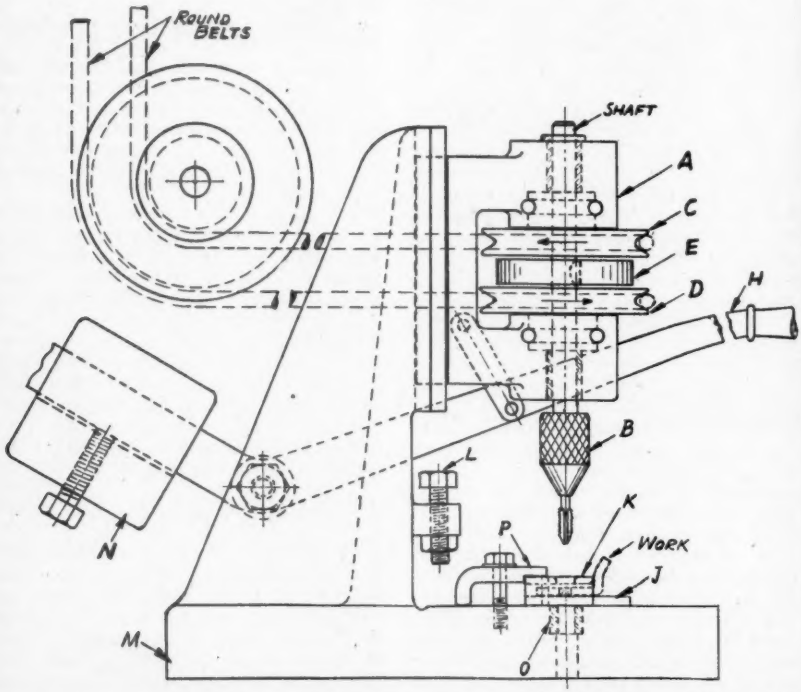


Fig. 182 — Vertical tapping machine, with a reversible spindle, adaptable to hole threading in a large variety of small parts. The principles of design, construction and operation are similar to those of the horizontal machine and corresponding parts have the same letter designations.

INDUSTRIAL PLASTICS

Estimating Plastics Molds

A TIME ESTIMATE FOR AN INJECTION MOLD

by Gordon B. Thayer
PLASTICS RESEARCH ENGINEER
Dow Chemical Company

One of the most important subdivisions of plastics tooling is estimating the man-hour cost of the molds, dies, fixtures and special equipment used to produce plastics part. A thorough knowledge of the plastics fabrication and tooling methods involved is a primary requisite for the cost estimator. Most of the tool estimating in the plastics industry is done by plastics engineers who have learned every phase of the technical business of manufacturing plastics fabrications as a preparation for their work.

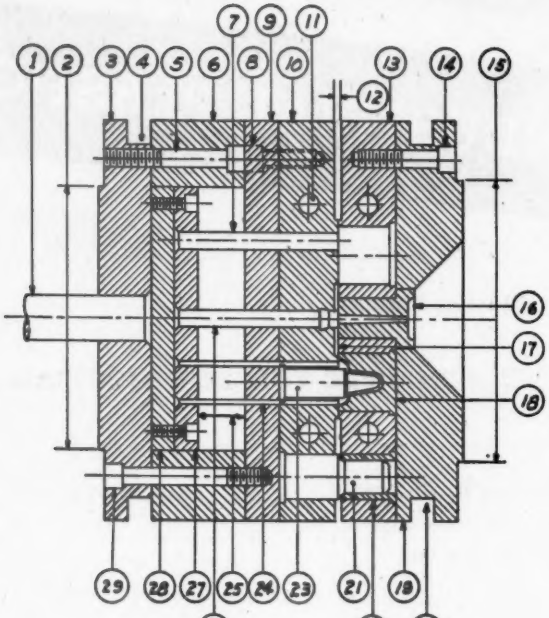
Man-hour costs for several representative mold parts and molds for plastics will be derived by a method which is typical in the plastics industry. Time table data is included to be used as a general guide. The data are adapted to plastics mold work from information first published by George Dannes in "Die Designing and Estimating",* a book which deals with metal stamping dies. Much additional data is included to supply material required especially for this particular method of estimating.

*Published by American Industrial Publishers, 311 Fairmount-Cedar Bldg., Cleveland 6, Ohio.

The estimating method which has been selected for description consists of listing the various mold parts in the order of their complexity, with the more complex parts first. Thus, an injection mold would be itemized as follows:

1. Cavity blocks
2. Core blocks or forces
3. Cavity retainer plate
4. Core retainer plate
5. Stripper plate
6. Core pins
7. Cavity backing plate
8. Core backing plate
9. Ejector box
10. Ejector plates
11. Ejector pins
12. Sprue bushing
13. Sprue pin bushing
14. Guide pins and bushings
15. Ejector rod

The next step is to break down each of the above items into the operations required to produce them, and then to estimate the time required for each operation. This method allows the estimator to consider each individual operation separately. Even though he uses time tables for figuring the elements involved, he has an opportunity to consider whether the operations are more or less complex than the average, for which the tables are set up. As the estimator's experience grows, he will become able to estimate small items such as sprue bushings, guide pins, or bushings, without itemizing the operations.



Principal Parts

1. Ejector rod
2. Mounting boss—ejection half
3. Adaptor plate—ejection half
6. Ejector box spacer
7. Ejector return pin
9. Backing plate
10. Core retainer plate
13. Cavity retainer plate
15. Mounting boss—injection half
16. Sprue bushing
17. Runner
18. Cavity block
19. Adaptor plate—injection half
20. Guide pin bushing
21. Guide pin
23. Core block
24. Ejector pin
26. Sprue ejector pin
27. Pin retainer plate
28. Pin assembly plate
30. Water inlet
31. Water outlet

Fig. 1 Sectional elevation of ejector-pin type injection mold.

This may be very satisfactory when the run of work consists of many molds which are nearly alike.

In order to present, in a continuity, the tables of data on time values, and explanations of the method at the same time, a complete injection mold will be estimated and the tables of required data will be included as the description progresses. Then, because not all of the required time tables will have been introduced, some mold parts will be selected to illustrate the use of the remainder of the tables until all of the tables and elementary discussion are completed. In some cases, abnormal mold designs may be employed as illustrative examples, in order to include the various machining processes which are employed in mold building, and in order to present a completed mold estimate before all of the time tables are published.

The reader is urged to follow each article closely, and to keep all of the series at hand for convenient reference as the series of articles progresses.

An injection mold as shown in Fig. 1 has been selected as an illustrative example for estimating the number of man-hours of labor to produce it. The mold parts may be itemized as follows:

ITEMIZED PARTS LIST

Detail No.	Part	Size	Material	Number Required
18	Cavity Blocks	1½" dia. 1½" long	Mold Steel	6
23	Core Blocks	⅞" dia. 2⅛" long	Mold Steel	6
13	Cavity Retainer Plate	1½" x 6" x 8"	C.R.S.	1
10	Core Retainer Plate	1" x 6" x 8"	C.R.S.	1
19	Cavity Backing Plate	1½" x 6" x 8"	C.R.S.	1
9	Core Backing Plate	1½" x 6" x 8"	C.R.S.	1
3, 6	Ejector Box	1½" x 3" x 8"	C.R.S.	2
		1½" x 6" x 8"	C.R.S.	1
27	Pin Retainer Plate	⅝" x 3" x 8"	C.R.S.	1
28	Pin Assembly Plate	½" x 3" x 8"	C.R.S.	1
24	Ejector Pins	⅛" dia.	Drill Rod	18
26	Sprue Ejector Pin	¾" dia.	Drill Rod	1
7	Return Pins	¾" dia.	Drill Rod	4
21	Guide Pins	1⅜" dia. 2½" long	Tool Steel	3
20	Guide Pin Bushings	1⅜" dia. 1½" long	Tool Steel	3

The breakdown of operations is begun with the part at the top of the list, the cavity blocks. This itemization is listed below, with the time values included. The discussion and derivation of the time values in the tabulation follows it directly.

Although this mold cavity, as shown by the detail part drawing, is of a shape which should be hobbed, the contour will be considered as suitable for boring in order to simplify the estimate for illustration purposes. The following time tables list time values for operations in the cavity block list. Fig. 2 shows time which should be allowed for cutting off stock in a power hack saw. Fig. 3 lists time values for turning and facing solid stock. Fig. 4 lists time values for boring in solid, and Fig. 5 lists time values for hardening mold parts. Fig. 6 shows time values for polishing mold cavities. It must be kept in mind that the table values are average values for average workmen in average shops. The values should be adjusted more or less to take into consideration the condition of equipment, the availability of proper equipment, the experience of the men on the kind of job being estimated, and the relative difficulty of the machining operation.

Fig. 2 applies for machine steel, and annealed mold steel. For high alloy or hob steel, add 50% to 100%.

The two tables, Figs. 3 and 4, give time values for round, or lathe work. The basic material is for oil hardening tool steel, or for alloy mold steel. Fig. 3 time values are based on machining standard mill stock to diameters listed in the table. A factor of 70% of the listed values will apply when the material is cold rolled steel, or machine steel. Set up time is included in the figures.

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PLASTER PATTERNS

SIMPLIFY PLASTIC TOOLING

Harold Clark
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Outstanding accomplishments of World War II has been our tooling and production. The production achievements get the headlines but behind every production record is a tooling achievement which must be an accomplished fact before production can begin. Once it was clear that we needed war equipment, the ten years lead held by the Axis began to dwindle as American industry rolled up her collective sleeves and in an incredibly short time this lead became an "also ran" when compared with our current all-time production miracle. New ideas which could clip valuable minutes from an operation superseded long accepted production methods. Having proven their value, many of these ideas will continue in our post war production.

Plastic tooling, as described in the July issue,* is one of these interesting tooling techniques that lays the groundwork for production methods which have post war possibilities. However, of equal importance and interest is the high state of perfection reached in the making and adapting of plaster patterns which have become a working partner in producing accurate, economical tools at unbelievable speeds.

Experience in the aircraft industry indicates that in most instances only one plastic tool is required to be cast from each mold. This emphasized the need for some quick, yet accurate method of making the mold for each individual plastic tool.

*"Plastic Tooling Value Proved by Aircraft Production," pp. 123-128.

Pattern makers have long been seeking improved materials as a means of increasing speed without the loss of accuracy. Gypsum plaster in its various forms and mixtures has proven an ideal material for developing the complex contours common to airplanes.

The making of wood patterns has always been exacting work requiring not only a high degree of skill but also considerable experience. Its success depended upon many points—the type of wood, direction of grain, how it was laminated and the precision with which it was worked into final form. No matter how careful had been the work, the finished pattern was affected by moisture and changes in humidity.

By comparison, plaster patterns are made by a technique which is vastly different from wood patterns, resulting in substantial savings of both time and material. Also, the completed pattern has greater dimensional stability and is not appreciably affected by changes in humidity.

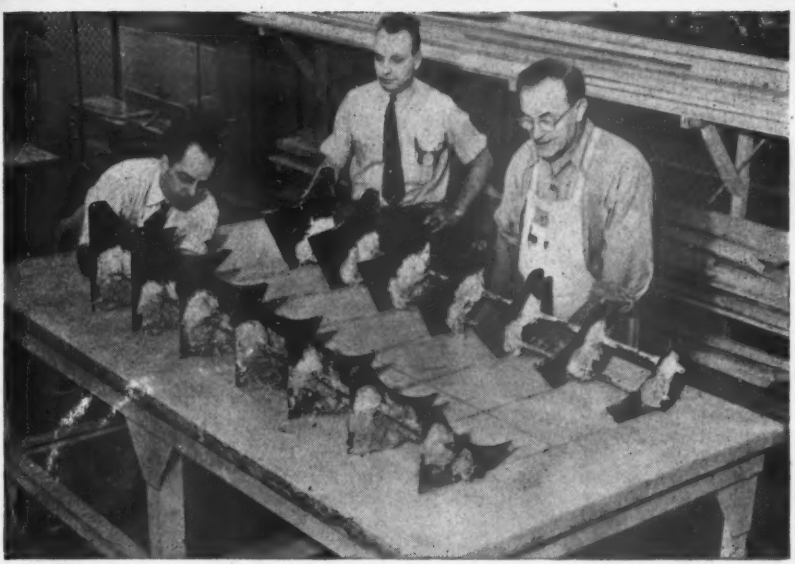
After the accurate plaster pattern has been made, it is then an easy matter to make from it the plaster mold in which the plastic tool is cast.

At the Buffalo Plant of the Curtiss-Wright Corporation, the plaster pattern department is under the direction of Edwin Robertson who has developed a corps of experts in this new field. His department is currently producing a wide variety of precision plaster patterns and molds of all sizes and shapes.

As a means of clarifying the various steps in the development of plaster patterns and illustrating the close relationship between them and the plastic tooling program, the following general outline is given:

The first step is a general discussion between the plastic tooling and the plaster pattern groups. At this time, consideration is given to the following points:

1. How shall the part be produced? By draw-die or by stretch press?



Templates for a right and left fillet are set up on the layout which is marked out on the marble-top table and held in position by applications of wet plaster. Edwin Robertson, foreman of Plaster Pattern Department, looks on.

The actual surface between the templates has been filled in and the two parts are ready to be merged into one form. The "fairing in" or generating the actual surface between the templates requires a high degree of skill.

2. Are there rights and lefts involved? If so, is it possible to combine them and produce a pair in one operation?

3. What general form of the finished plastic tool will enable the parts to be produced with the greatest speed and least waste of materials?

When this information has been decided, the pattern maker then determines the necessary steps to make the plaster mold in which the plastic tool will be poured. Here, again, several factors are involved:

1. The shrinkage of the plastic during the curing process and the after shrink.

2. The shrinkage of the plaster when the mold is made and the expansion of the plaster mold in the oven while curing the plastic.

3. How to save plastic material. Will it be necessary to cast it solid or can it be cored and still withstand the pressure exerted upon it during the forming process.

4. The drafting of the mold to enable the finished part to be removed.

5. The proper venting and sprueing the mold to eliminate air pockets and facilitate pouring.

6. Will the mold be used more than once?

Only when all of these factors are known can work on the plaster pattern be started.

Since the marble-top surface table is used as the structural base of most plaster patterns, the plan of the pattern is laid out directly on this surface using a shrink scale which compensates for the composite shrink and expansion of all factors. Station numbers and other necessary reference information are indicated.

In the meantime, templates have been made, also, to appropriate shrink scale, using information obtained from master templates in the mold loft. Holes, measuring about ⅝-inch in diameter, have been punched in the interior part of the template and others, measuring about ⅛-inch in diameter, have also been punched at regular intervals approximately 1 inch in from the working edge of the template.

Templates Are Assembled

These prepared templates are then erected at their appropriate locations on the layout marked on the marble-top table and are held in position by applying wet plaster. Iron reinforcing bars are now threaded through the large holes and fastened in place by sisal fiber dipped into wet plaster and wrapped around the bar on both sides of the hole. This insures sturdy, accurate positioning of the various templates and provides the skeleton of the completed pattern.

Now, ⅛-inch soft iron wire is threaded through the small holes near the working edges and burlap dipped in wet plaster is then woven in and out of these wires, creating a hollow shell with only the edges of the template protruding. Fresh plaster is applied to this burlap backing between the templates and is modeled into shape, using the edges of the templates as guides. This "fairing in" or generating the actual surface between the templates requires a high degree of skill and the resulting form is an actual "mock-up", to shrink scale, of the true surface to be produced.

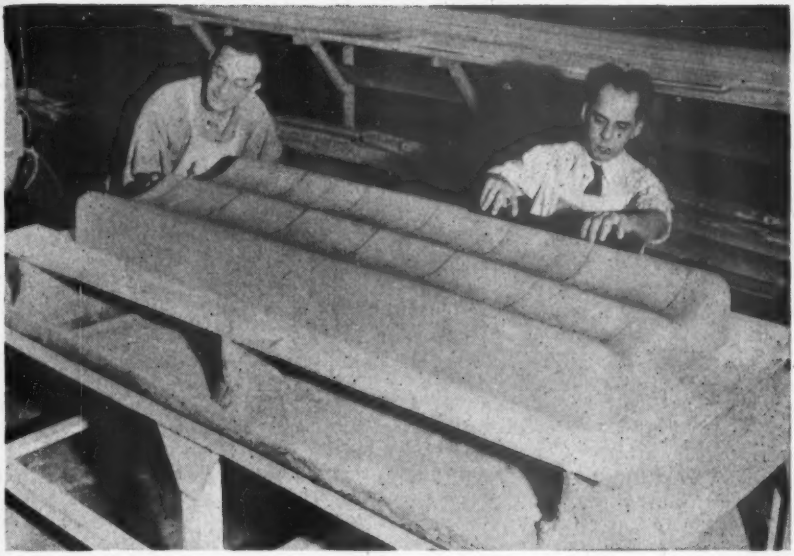
Sometimes, this mock-up is used as it stands, or in the case of rights and lefts, two forms will be made and then combined to provide the best working arrangement. When the mock-up has been completed and placed in position for making the female mold, it is made very smooth and evenly coated with parting mixture, since any surface unevenness will be transferred to the plastic casting.

By using wet plaster, sisal fiber, a wood frame and perhaps iron reinforcing bars, if the form is large, an exact mold is made over the mock-up. When the setting has advanced to just the right point, the mold is removed from the plaster pattern and allowed to dry.

Method for Cored Castings

If the plastic casting is to be solid, no further work is necessary save coating the mold with a parting agent. However, if the casting is to be cored, a layer of clay or similar material, equal to the desired thickness of the finished plastic casting, is laid in the form. Additional bulkheads of plywood or similar material, are added to divide the cavity into a series of cores. The actual cores are built up of plaster, fiber and reinforcing bars depending on their size and shape. The method of holding

(TO PAGE 116—PLEASE)



The right and left parts are completely merged into one form and are now ready for making the mold. The form is an actual "mock-up", to shrink scale, of the true surface to be produced.

The completed mold, coated with the parting agent, and the plastic casting made in it which has just been removed from the mold. The plastic casting is then backed up with wood, the surface polished and it is ready for production.

(CONTINUED FROM PAGE 105)

CAVITY BLOCK ESTIMATE

Cut off stock	1½" dia. (Fig. 2)	.1 hr.
Rough turn and face both ends	1½" dia. (Fig. 3) 1½" long	.8 hr.
Bore Cavity	1" dia.—1" deep (Fig. 4) Add 250% for contour and blind bottom	.8 hr. 2.0 hr.
Harden	Small block (Fig. 5)	.2 hr.
Polish cavity	Plain Cavity (Fig. 6) 2 sq. inches Add 100% for deep cavity	.6 hr. .6 hr.
Grind O.D. and Length	Same as rough turn oper. Add 100% as length cannot be ground until thickness of retainer plates is known	.8 hr. .8 hr.
Total time per cavity block		6.7 hr.

FIG. 2—TIME VALUES FOR CUTTING OFF STOCK

Small rounds, flats, squares 2" dia., 2" square, 2" thick x 4"	.1 hr.
Large rounds and squares 2" to 5"	.2 hr.
Large flats, too wide for flatwise. Allow for set up clamping.	.1 hr.
Sizes over 6" wide, thickness up to 3".	.1 hr.
Add. per 3" depth of cut, for over 3" deep	.1 hr.

By turning and facing is meant machining the front face, turning the length of the work on the O.D., reversing the work in the lathe and facing off the back face.

Fig. 4 time values include starting and finishing holes out of the solid blank, including set up time. The values in Figs. 3 and 4 are for straight cuts only.

Additional allowances should be made as follows:

Simple form cutting, add..... 50%
Intricate form cutting, add.....100%
Template turning, add 200%
Template boring, add.....200% to 300%
Shoulders or blind bottoms, add...50%

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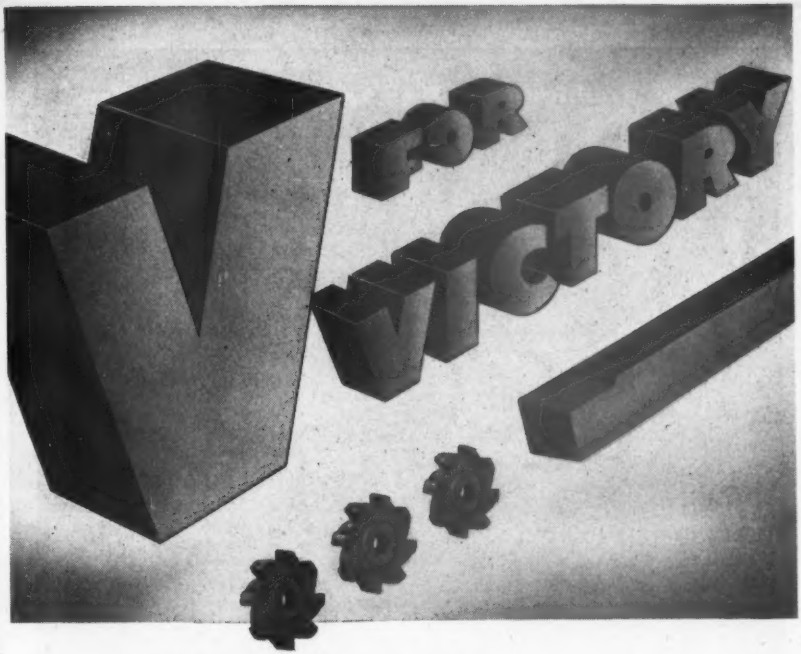
FIG 3—TIME VALUES FOR TURNING AND FACING SOLID STOCK
(OHTS or Mold Steel)

THICKNESS / Sq. Inches	½	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
½	.5	.6	.7	.8	.9	1.1	1.5	1.8	2.1	2.4	2.6	2.8	3.1	3.3	3.5	3.7
1	.6	.7	.8	.9	1.0	1.3	1.8	2.2	2.6	2.7	2.9	3.1	3.3	3.5	3.7	4.0
2	.7	.8	.9	1.1	1.6	2.0	2.3	2.5	2.7	3.0	3.3	3.6	3.8	4.1	4.5	4.8
3	.8	.9	1.0	1.5	2.0	2.2	2.4	2.7	3.0	3.4	3.8	4.2	4.5	4.9	5.3	5.7
4	1.0	1.2	1.5	2.0	2.2	2.4	2.6	2.8	3.2	4.0	4.6	5.3	5.8	6.2	6.7	7.2
5	1.3	1.6	1.8	2.2	2.4	2.6	2.8	3.1	3.7	4.3	5.2	6.2	7.1	8.0	9.2	10.3
6	1.5	1.8	2.0	2.3	2.5	2.8	3.0	3.3	4.0	4.6	5.8	7.0	8.2	9.4	10.6	11.5

TIME IN HOURS



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In two years of hard work Cooper-Bessemer's Meehanite tool shanks, forming tools, milling cutters and special tools have done the toughest cutting jobs, and time and again have proven superior to carbon steel shanks and steel forgings.

Carbide-tipped Meehanite tool shanks can cut faster than steel shanked tools because they dissipate heat faster, don't load up as fast, have better damping qualities. They require less machining to start with, and are easier to cut and grind. Their coefficient of expansion is nearer to that of carbide-tips than is steel's.

For testing in actual production in your own machines, send for Bulletin No. 53-T-2. Pick out tool shanks, forming tools or milling cutters to fit your needs and we will send samples for free trial. No obligation, of course. Write to The Cooper-Bessemer Corporation, Mt. Vernon, Ohio.

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Proper Identification of High Speed Steels Saves Time

Plants using both tungsten and molybdenum types of high speed steels should give serious consideration to the establishment of an efficient identification system—one that will keep the steels separated from bar stock to finished tool.

The danger of spoilage is particularly acute when mixed lots get into the heat treaters' hands.

The recommended hardening temperatures for tungsten types are 100° to 200° F. higher than those for the molybdenum types. Treating the latter so far above recommended temperatures will spoil them for cutting tool service. Treating the tungsten types that far below recommended hardening temperatures will not develop the required red hardness.

Heat treaters sometimes use the "sweating" of tungsten types as an indication that the steel is up to proper hardening temperature. *THIS DOES NOT HOLD WITH MOLYBDENUM TYPES.* In their case, a pyrometer should always be used to determine when the steel is at the recommended hardening temperature.

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(CONTINUED FROM PAGE 110)

FIG. 4—TIME VALUES FOR BORING IN THE SOLID
(OHTS or Mold Steel)

THICKNESS \ Sq. Inches	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
½	.4	.6	.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
1	.6	.8	1.1	1.4	1.9	2.4	2.9	3.5	4.0	4.5	5.0	5.5
2	1.0	1.2	1.6	2.0	2.4	2.8	3.4	4.0	4.5	5.1	5.6	6.0
3	1.3	1.7	2.1	2.5	2.9	3.3	4.0	4.8	5.2	5.7	6.1	6.5
4	1.8	2.1	2.5	3.0	3.6	4.3	4.9	5.6	5.9	6.3	6.7	7.0
5	2.2	2.6	3.3	4.0	4.7	5.4	5.9	6.5	6.8	7.2	7.6	8.0
6	2.7	3.2	4.1	5.0	5.8	6.7	7.1	7.4	7.7	8.0	8.4	9.0

TIME IN HOURS

The table values for turning, facing, and boring may be employed for corresponding grinding operations. The time required for grinding to size, after turning, facing, boring operations are completed will be equal to the table values for the lathe machining work, plus the percentage additions for increased complexity as listed above, where they are applicable.

FIG. 5—TIME VALUES FOR HARDENING MOLD PARTS

Small cavity blocks up to 3" greatest dimension, each	.2 hr.
Large rectangular blocks, up to 8" square by 3" thick	.5 hr.
Guide pins and bushings, each	.1 hr.
Small ejector pins, up to ½" dia., each	.3 hr.
in lots of 3 to 6 per heat, each	.2 hr.
For shapes other than plain round requiring special attention, add 50%.	
Carburizing packing, or protective packing, minimum allowance per lot of small parts	.4 hr.
Allowance on large pieces	.4 hr. to .6 hr.

Fig. 5 is based on handling time only. The time in the furnace is not counted, except when pieces like small ejector pins must be watched during the entire heat. Additional allowances should be made as follows:

Drawing, after hardening 100%
Plugging holes with clay 50% to 100%
Special cavity shapes subject to severe distortion 200%
Cyanide hardening 100%

Fig. 6 shows ordinary time for average polishing work with rotary polishing tools on flexible shafts or on polishing motors. Additional allowances should be made generously as follows:

Rough machine finish ..150% to 200%
Duplicator or contouring machine finish .....150% to 200%
Hand polishing 300%
Deep cavities, difficult to reach .....100% to 300%
Carburizing scale or heavy hardening scale 100%

Template and Form Tool

This particular mold cavity as modified for sinking by lathe boring, should be bored with a form tool. This is in accordance with good practice to obtain accurate contours so that pieces molded from any cavity will be the same shape as pieces molded from any other cavity. The form tool should be made by use of a template. Templates for plastics mold work are usually made of thin sheet steel, 1/16" to 1/8" thick, either cold rolled sheet or tool steel flat stock. The time to make a template and a form tool for this job will be estimated at 4 hours and 2 hours, respectively, without further explanation. Later, more detailed information for determining template and

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FIG. 6—TIME VALUES FOR POLISHING MOLD PARTS

Plain cavities, shallow, without small radii or large flat areas, per square inch	.3 hr.
Plain cores, without inside small corner radii per square inch	.2 hr.
Core pins, plain round, per square inch	.1 hr.
Small internal radii, impossible to reach with machine polisher, per linear inch	.2 hr.
Louvers and flutes, machine polishing per inch	.2 hr.
Intersection of three surfaces, machine polishing per corner	.4 hr.
Large flat areas, machine polishing, per square inch	.3 hr.

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DRILL AND FIXTURE IN OPERATION

A special drill and fixture that provide a constant flow of coolant right at the cutting edge—right down to the deepest point—clearing away the chips at the same time.

Solves the problem of drilling holes of extremely small diameter—far beyond the limits of the smallest drill that can be made with an oil-hole.

Developed (and patented) by the makers of the famous "SUPER-KOOL" Oil-Hole Drill, which has won acclaim wherever oil-hole drills are used.

NOTE:

At present, due to the great demand for metal cutting tools and our limited facilities, we are unable to supply engineering details. Please keep us in mind for postwar.

Drilling in Process

Note how the coolant is flushing the chips from the bottom of the hole. The drill has just started to break through.

Drilling Completed

In this photograph the drill has broken through. The solid column of coolant indicates clearly the force of the coolant during the drilling operation.

DETROIT REAMER & TOOL COMPANY

2830 E. 7-Mile Road Detroit 12, Michiga

Plaster Patterns Simplify Plastic Tooling

(CONTINUED FROM PAGE 108)

the cores is then added and following the removal of the clay, the form and cores are covered with the parting agent and are then ready to receive the liquid casting resin used to produce the plastic tool.

After pouring the liquid casting resin, the entire mold is placed in the oven where it remains during the curing cycle of the plastic. After curing, the plastic casting is removed from the mold, backed up with wood to serve as a means of securing it to either the stretch press or draw-die, the surface of the plastic is polished and it is ready for production.

Although the template method of making plaster patterns is the one most generally used, other types of patterns, having regular surfaces, can be made by using a slightly different approach.

If a pattern, or a section of the pattern, has a true radius, it can easily be made by reversing the procedure of a potter's wheel. In this case, the work remains stationary on the surface table while the template containing the proper profile, is revolved around the work, generating the surface in the wet plaster.

Box or rod turning of cylindrical or kindred shapes is accomplished in a manner similar to a slow speed lathe. The core is revolved by hand while adding wet plaster and fiber. When approaching the finished size, wet plaster alone is added and is shaped by the fixed template carrying the desired contour, past which it revolves. Turnings of approximately 8 feet in diameter and 11 feet long have been made in this manner. Being hollow, these large turnings can be constructed economically.

Straight runs or contours can be made by mounting a female template on a runner which enables it to slide sideways along the edge of the surface table. By placing wet plaster in front of the template as it moves along the surface table, and continuing the operation until the plaster has set, an accurate and smooth pattern surface is quickly generated.

All patterns made by these last described methods can be cut into segments and re-assembled to form patterns with complex lines which might otherwise be extremely difficult to produce.

The speed and accuracy with which plaster patterns and plaster molds are made, plus their excellent surface qualities, have made them indispensible in the production of plastic tooling at Curtiss-Wright. Only time will tell the ultimate end to which these two processes will be developed and the part which they will play in our post war manufacturing.

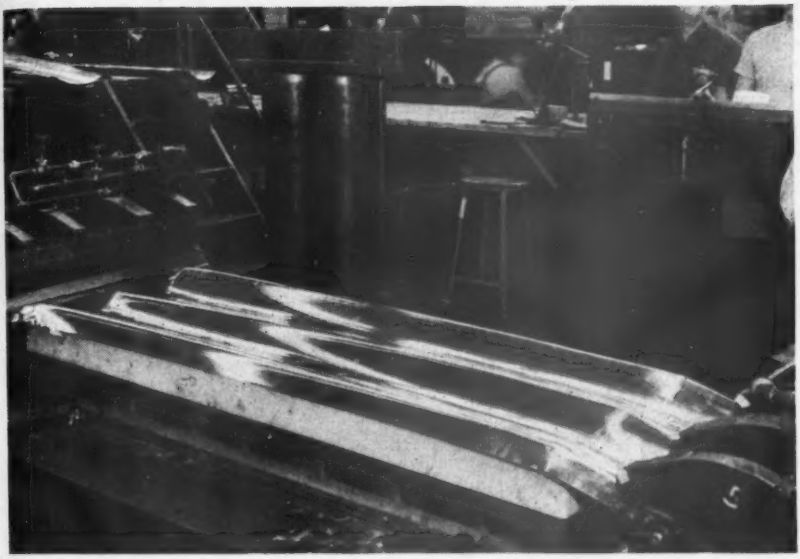
In the third and last article scheduled for September, specific data regarding the production and operation of plastic tools will be given.

The Story of Reanite

The Reanite Bonding Process, based on the use of Reanite cement, a synthetic resin, is utilized for uniting metal to metal, rubber or synthetic rubber, plastics, leather or wood to metal, or to each other. The resulting bond has an ultimate strength that in many cases surpasses the strength of the materials joined; the application is a simple one-coat process by spray, brush or dipping; the bond remains effective through a temperature range of —50° F to as high as 300° F; the bond is non-corrosive to metals or other materials.

Metal-to-metal bonds by the Reanite process develop as high as 3,000 psi in shear. Assembly may be metal to metal direct or with a thin layer of rubber between. The latter is advantageous where vibration fatigue is severe or sound insulation is desirable. Almost all metals may be suitable bonded. Rubber to metal bonds have adhesive strength up to 1,200 psi in tension, giving a wide margin of safety since most standard applications call for bonds of 250-300 psi.

Adhesions vary with plastics. Excellent adhesions have been obtained with a number af phenolics and other thermosetting materials. Reanite will bond wood to steel, aluminum, copper and other metals with a bond stronger than the wood itself. "The Story of Reanite" is available from U. S. Stoneware Co., Dept. TD, Akron, Ohio. 771-N



The plastic casting, backed up with the necessary wood base to hold it in position, is installed on the stretch press and the aluminum sheet is being stretched over it.

The completed left and right fillets are shown in the plastic casting over which they were stretched. The art of casting liquid resins opens a new technique for short run forming tools.

(CONTINUED FROM PAGE 113)

form tool time will be given, at a place where the continuity of this mold estimate will not be disturbed.

The detail estimate for the cavity blocks and the form tool and template is now completed, ready to be included in the recapitulation which will follow the detail estimates for all of the various mold parts after they are all completed. The next parts on the list are the core blocks, and their detail estimate follows:

a template or at least with a template. In this case, both will be used in computing the time allowance. This will be estimated at 6 hours for the two items, as was done in the case of the cavity form tool and template.

The completion of the estimates for the cavities and cores covers the most critical part of the estimate. However, very often, the various mold plates have special requirements, and the detail method of estimating provides a good

Core Block Estimate

LIST OF OPERATIONS—CORE BLOCK

Cut off stock	7/8" dia. (Fig. 2)	.1 hr.
Rough turn and face blank	7/8" dia. (Fig. 3) 2 1/4" long	.8 hr.
Turn contour	Add 50% to turning and facing time above	1.2 hr.
Harden	Small block (Fig. 5)	.2 hr.
Grind O.D. and length	Same as cavity block	1.6 hr.
Polish Core	Plain core (Fig. 6) 2 square inches	.4 hr.
Total time per core		4.3 hr.

The core for this mold should be turned with the aid of a form tool and means of checking the plates for accurate time estimates.

The next installment will cover the detailed estimate of the cavity retainer plate and the core retainer plate of the same injection mold. The first and succeeding installments should be preserved since each Table of Time Estimates will appear once only.

Synthane

The types and forms, applications and properties of Synthane, a material of laminated paper or fabric impregnated with a synthetic resin are outlined in "Synthane Technical Plastics" a bulletin issued by Synthane Corporation, Dept. D, Oaks, Pa. The exceptionally wide range of uses of various grades, finishes, and combinations of formulations that are practical with Synthane are illustrated and described. Data on properties of Synthane in standard forms is unusually complete. Data includes molded-laminated and molded-macerated materials. The two grades of Silent Stabilized Gear Material, two anti-friction graphited grades of Synthane and Cam Blanks are shown. There is a valuable section on hints on designing with Synthane. The weight tables of sheets, rods and tubing are also of interest to the designer. Copies of this bulletin are available from the manufacturer. A99-N

Marcolite

Marcolite is being produced at present with Fiberglas and cotton duck as filler materials, both separately and in combination. The MR-type resins have been used to make laminated plastics materials for service planes (cf. "Glass Reinforced Laminates for Structural Plane Parts", page 98-L, May 1944 issue of this journal). Detailed descriptions of Marcolite are restricted but it is known that it is made in sheets from as thin as .010" to 3" or more and is available in flat sheets and fabricated parts. The MR-type resins produced by Marco Chemicals, Inc., now a Continental subsidiary, are thermosetting and shaped parts are either molded or hot formed. Marcolite acquires a hard, polished glass-like finish in manufacture and can be machined, cut, sawed, drilled, lapped, threaded, dimpled and die stamped.

An 8-page circular gives information on advantages and applicability. A copy will be sent at your request. B5-N

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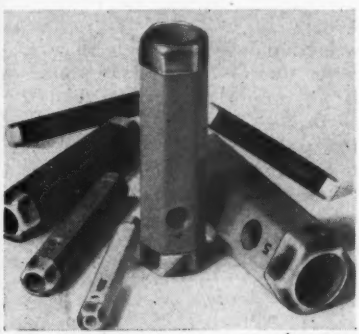
Taperlock Plastic

GAGE HANDLES

Made of durable plastic material, one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue . . . an advantage appreciated by women inspectors.



Federal Taperlock Plastic Gage Handles have proved very satisfactory for glass gages. Being so much lighter than metal handles the danger of chipping and breaking is greatly reduced.

Plastic Handles insulate, protecting gages from bodily heat which might affect accuracy.

Easily marked for identification with the same tools used for marking metal handles. Available in SEVEN sizes—00 for small gages, 0, 1, 2, 3, 4 and 5. In FOUR colors — Red, Green, Yellow and Black.

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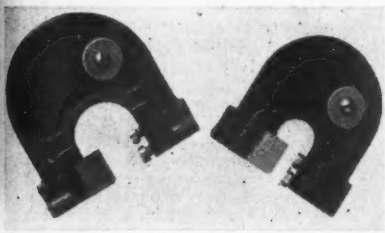
PROGRESS ON PARADE

ADJUSTABLE SNAP GAGES. It has recently been announced that four models of midget type gages have been added to the George Scherr Co.'s line of Atlantic Adjustable Limit Snap Gages. These are designed for checking and inspecting extremely small and delicate parts and are manufactured in ac-



cordance with American Gage Design Standards. The midget gages can be set to handle work from .000" to .760". Complete details on the midget type gages can be obtained from GEORGE SCHERR CO., 200-B Lafayette St., New York 13, N. Y. **490.5-N**

A NEW PROTECTIVE SKIN CREAM called Clad has been announced by THE B. F. GOODRICH CO., Akron, O. Clad is made in two types, for dry and for wet working conditions. Because it is made as nearly neutral to the skin as possible, the dry cream eliminates skin drying or any tendency to cause burning or irritation even under prolonged usage. It protects exposed portions of the body against dirt, grease, grime and any other hard-to-wash-off substances. The cream for wet use is made for protection of the skin where water and other dilute aqueous and mild chemical solutions are present. Both types of cream have been constantly tested under regular operating conditions in the company's factories. While not as effective as rubber gloves, it is said that the use of protective creams greatly assists workers to reduce hazards from dermatitis and reduces "wash-up" time. The B. F. Goodrich Co. will send more information on Clad upon request. **A4-N**

NEW ALLISON COLLET CHUCK. The Allison Tool & Engineering Co. of Los Angeles is now manufacturing a new collet chuck with a full circular, low pressure cam to activate the collet closing mechanism, which assures the user of any desired collet gripping pressure for various materials. The use of a circular cam is said to reduce the pressure at any point approximately 90% as compared with collet closing mechanisms utilizing high pressure pins, wedges or dogs. Very little pressure and short travel distance result at

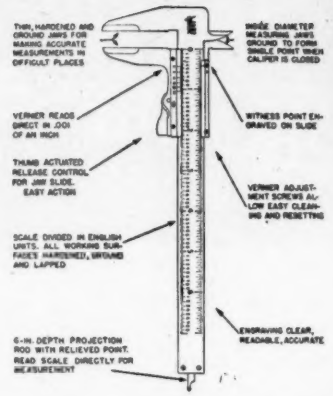
the operating handle when closing or opening the collet, making it adaptable to automatic screw machines. The operating handle travels at right angles to the ways of the lathe bed allowing the operator one free hand to insert, feed the stock or operate the bed turret. The new collet chuck is available in two sizes, one for 1½", 8 thread, spindles with ⅞" collet capacity and one for 2½" spindles and under, with 1⅝" collet capacity. Write ALLISON TOOL & ENGINEERING CO., 4031 Whittier Blvd., Los Angeles 23, Calif., for full particulars. **960-N**

THE DILLON TENSILE TESTER, manufactured by W. C. Dillon & Co., Inc., is a light weight (132 lb.) but rugged, precision tester for checking rounds, flats and odds shapes of plastics, spot welded specimens, riveted assemblies, cloth, wire, rubber, etc. A peak

load of 10,000 lbs. is easily applied by a counterbalanced handwheel. All Dillon Tensile Testers are supplied with standard gripping jaws for flat specimens, unless a specific diameter round is specified. Maximum jaw separation is 9¾", or 11¾" inside jaws; special jaws are made for almost any type of specimen. Seven different loading ranges are made possible with interchangeable Dynamometers. Double sealed ball bearings at four points of Dynamometer suspension assure

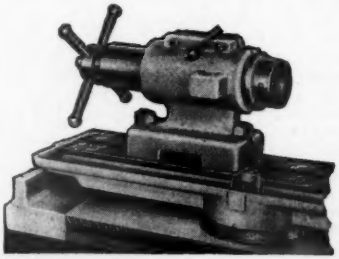
true, frictionless loading. The upright pressure columns are of high grade steel 1¼" in diameter. The unit stands 37" high, with a base 6" high. Provision is made in the design of the Dillon Tester for easy motorization with a gear reduction unit or by pulley drive. There is ample room in the instrument for Extensometer measurements should they be required. For your copy of Bulletin No. 141 giving a detailed description of the Dillon Tensile Tester, write W. C. DILLON & CO., INC., 5414 W. Harrison St., Chicago 44, Ill. **A58-N**

NEW VERNIER CALIPER. The new Vard precision caliper provides a quick and accurate reading of an outside diameter as measured between the large jaws. Inside diameters can be checked just as quickly by reading the same scale showing spread of minor inside jaws. Depth of a hole is measured by inserting the depth projection rod, which is an integral part of the tool, and reading the distance from the end of the rod to the body of the caliper on the same scale. Although Vard


THIN, HARDENED AND GROUND JAWS FOR MAKING ACCURATE MEASUREMENTS IN DIFFICULT PLACES
INSIDE DIAMETER MEASURING JAWS GROUND TO FORM SINGLE POINT WHEN CALIPER IS CLOSED
VERNIER READS DIRECT IN .001 OF AN INCH
WITNESS POINT ENGRAVED ON SLIDE
THUMB ACTUATED RELEASE CONTROL FOR JAW SLIDE. EASY ACTION
VERNIER ADJUSTMENT SCREWS ALLOW EASY CLEANING AND RESETTING
SCALE DIVIDED IN ENGLISH UNITS. ALL WORKING SURFACES HARDENED, UNFRAMED AND LAPPED
ENGRAVING CLEAR, READABLE, ACCURATE
6-IN. DEPTH PROJECTION ROD WITH RELIEVED POINT. READ SCALE DIRECTLY FOR MEASUREMENT

vernier calipers are made in one size only—six inches between the jaws—they have seven inches of graduations on the face, making possible a full six-inch reading. The caliper is constructed of precision ground steel and its jaws are hardened and lapped. After the calibrations are clearly marked, the numbers are engraved. One edge is divided in thirty-seconds, the other in fortieths which read in thousandths with the vernier. The vernier is integrally mounted on the slide and is locked in position or released by pressure on the thumb-lever. In addition to the vernier there is a witness point for reading the thirty-second scale. For additional data on these new Vernier Calipers, write VARD, INC., Pasadena 8, Calif. **509-N**

THE NEW NO. B647 TAP GRINDING FIXTURE, a sturdy, compact unit, is now being manufactured by the K. O. Lee Company of Aberdeen, South Dakota. It is adaptable to any make tool grinder, and will accommodate taps from No. 8 to 2½" in diameter. Maxi-



mum accuracy is maintained on taps through the use of collets. All grinding operations, including grinding the reliefs, grinding the flutes and salvaging broken taps can be performed

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● **FOR years engineers and tool makers have sought to devise a concentric SUB-LAND Cutting Tool. Previous attempts have failed because no one was able to establish a perfectly circular land along the entire length of the lower flutes.**

MOHAWK, fortunately, has discovered a method of establishing a perfectly circular land. The unique value of SUB-LAND Cutting Tools, aside from the fact that cavities are machined to size and concentric, is that the over-lapping edges, exclusive with SUB-LANDS, make perfectly square, clean corners and faces. Each flute is polished and provided with ample and positive chip clearance, thus easily taking care of its own chips. We regularly manufacture two, three, and four step SUB-LANDS, thus solving almost any step cavity problems.

Patents pending on all Mohawk sub-land tools.

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Mohawk TOOL COMPANY

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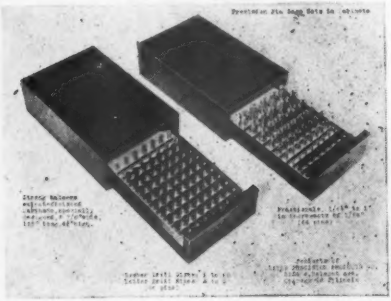
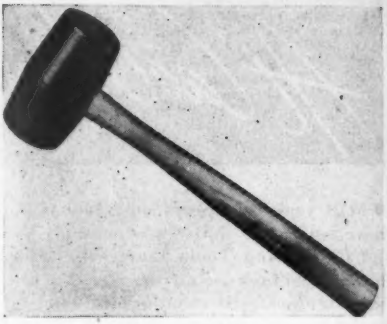
with one set-up. Two, three, four, five and six flute taps can be ground either right or left, and T-slot blocks to fit any make tool grinder table will be furnished on request. K. O. LEE COMPANY, ABERDEEN, S. D., will send illustrated literature on request. **361-N**

PRECISION PIN SETS IN SPECIAL CABINETS. Included in the new compact cabinets of gage pins recently announced by United Precision Products Co. are Precision Pin Sets, Number Drill sizes 1 to 60, Letter Drill sizes A to Z (86 pins) and Fractionals $\frac{1}{64}$" to 1" in increments of $\frac{1}{64}$" (64 pins). These are made of high quality gage steel and are hardened to 60-63 Rockwell C scale. Tolerances are made to individual specifications. The walnut-finished cabinet is specially designed for its purpose, containing brass strips



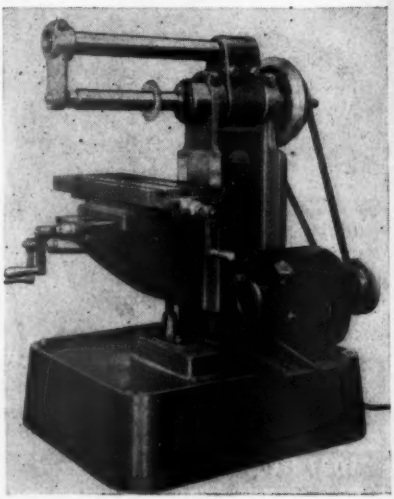
with letter, number or fractional permanently fixed in white to identify each gage and its position. Gages are progressively arranged for instant pickup. The small pins are in glass vials having heavy plastic screw tops and felt bottom cushions for added protection. The cabinets are 9⅞" wide, 15½" long and 4½" high. Complete information may be had by addressing UNITED PRECISION PRODUCT CO., 3526 West Belmont Ave., Chicago 18, Ill. In asking for prices, gage users are requested to specify tolerances desired. **503-N**

TAYLOR HI-EFF MALLETS. The Taylor Manufacturing Co.'s new no-mar mallet features the "Hi-Eff" head made of a special shock absorbing material that hits hard without hurting. It is designed for use by aircraft, automotive, radio, furniture, electrical and other manufacturers of fine equipment; tool and die shops and every industrial plant where finely finished surfaces must be protected. The new Hi-Eff mallet comes in three weights; 12 oz., 18 oz., and 24 oz., but the heads of all three are of the same size and no weighted cores are used. This results in better balance, greater compactness, easier use and longer life. The Hi-Eff Mallets are sold only through industrial suppliers. TAY-



LOR MANUFACTURING CO., 3056 W. Meinecke Ave., Milwaukee 10, Wis., will send further details. **486-N**

REMOVABLE OVERARM. The Benchmaster Manufacturing Co. has developed a removable overarm that will greatly increase the versatility of combination horizontal and vertical milling machines. This attachment consists of three parts which make it possible to use a regular milling machine arbor in a horizontal mill. It is readily mounted on the machine by removing the driving pulley from the rear of the horizontal spindle, slipping out the spindle itself by releasing two accessible screws. A heavy semi-steel casting is mounted on the horizontal spindle which holds a precision ground stress proof overarm carrying the outboard support. Details will be sent by BENCHMASTER MANUFACTURING CO., 2952 W. Pico, Los Angeles, Calif. **169-N**



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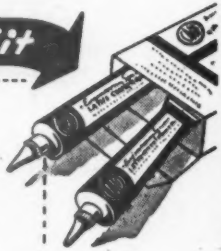

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Two New DE-STA-CO Clamps for AIRCRAFT JOBS

Model 462-B **Model 462**

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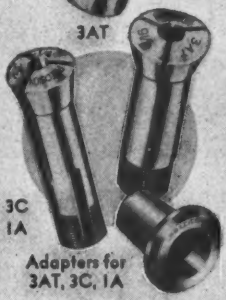

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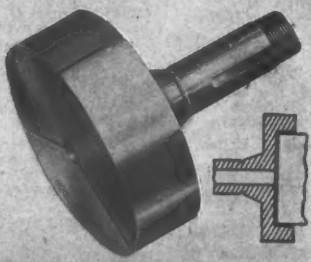
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.



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Rock Island Lines First to Use Radio in Train Operation

While a number of railroads have been experimenting with radio communications in the direction and operation of trains, the Rock Island Lines is the first to inaugurate a radio communications system in what is known as the micro-wave region, a field of very high frequency radio waves.

Tests of radio communications under actual operating conditions have been conducted in the yards and trains of the Rock Island Lines at Blue Island, Illinois, near Chicago. The program was launched recently in an inaugural broadcast. Participating in the ceremonies were J. D. Farrington, the Rock Island's chief executive officer; W. H. Hillis, operating officer; E. A. Dahl, electronic engineer who installed the system; and C. O. Ellis, superintendent of telephone and telegraph.

The radio installation provides two-way communications between the Rock Isand's yardmaster's office in the road's largest yards in the Chicago area at Blue Island and the switch engines that handle thousands of cars daily in making up and dispatching trains.

Permits granted the Rock Island include two-way radio communications between front and rear ends of trains, dispatcher and caboose or engine, and between brakemen and flagmen and trains.

The radio equipment is operated on the 40 megacycle band of frequencies. Through the use of these frequencies, it is expected that many of the difficulties hitherto experienced in radio train communications will be overcome, because these micro-waves are very short, travel in a straight line, and are not reflected by the Heaviside layer which blankets the earth's outer atmosphere.

The railroad has been authorized to use radio telephone and telegraph emission, including the use of both amplitude modulation and frequency modulation. Frequencies authorized are within the bands 30 to 40 megacycles and 100 to 400 megacycles.

Emergency Motorola built units were used in a recent line break in Kansas to bridge 30 mile gap. These units could be set up for similar duty anywhere along the line. In case of a line break, the broken ends of the telephone lines are connected into the units and a conversation can be carried on over the telephone and through the break by radio.

Eventually, power for the radio units will be provided by motor generator driven off the starting battery of the Diesel. At present, however, gasoline generator sets supply the power.

First successful long-distance test of radiophones for intercommunication on trains was recently conducted on a Santa Fe train nearly a mile long by a party of experts and officials, including T. P. Brewster of Chicago, superintendent of telegraph for the Santa Fe, and L. R. Thomas, electronic engineer.

Reports indicate that not only will radio replace the old system of hand signalling, but that experiments in radar will make train operation safer, and that a future possibility is radio telephone hookups so that passengers might talk with their offices or homes while traveling.

With two additional technical societies participating, nearly a thousand men are collaborating in preparing the program for the National Metal Congress and War Conference Displays, to be held in Cleveland's Public Hall the week of October 16.

Five Societies to Meet in Metal Congress

The two additional organizations are the Society for Experimental Stress Analysis and the American Industrial Radium and X-Ray Society. Other cooperating societies in the Congress are the American Society for Metals, sponsor of the event, the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers, and the American Welding Society. "With these five national societies planning some 150 research papers for presentation at the Congress, the most interesting program in the 26-year history of the event is guaranteed," said W. H. Eisenman, national secretary of the American Society for Metals and managing director of the Congress and Displays.

This year's program will begin on Monday, October 16, and run through Friday, October 20, and all branches of the metal industry are represented in the five societies participating.

The Society for Experimental Stress Analysis has national headquarters at the Massachusetts Institute of Technology, with Prof. W. M. Murray of M.I.T. as president. During the Metal Congress the S.E.S.A. will have headquarters at the Carter Hotel, Cleveland. Technical sessions will be held both morning and afternoon on Tuesday, Wednesday, Thursday and Friday, October 17 through 20, with the annual dinner meeting on Thursday evening.

The American Industrial Radium and X-Ray Society will have technical sessions morning and afternoon on Thursday and Friday, October 19 and 20, with a special meeting of the Cleveland Section on Monday, October 16, and the annual meeting of the Society on Thursday afternoon. Convention headquarters will be at Hotel Hollenden. The technical program of this Society is under the direction of Roy W. Emerson, metallurgist, Pittsburgh Piping and Equipment Co., Pittsburgh. M. B. Evans, Ternstedt Mfg. Div. of General Motors Corporation, Detroit, is president.

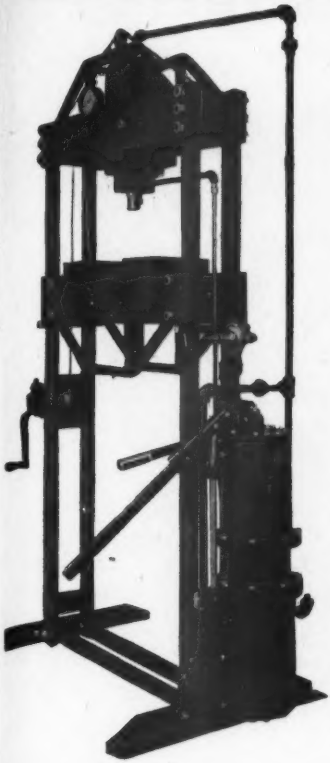
The American Society for Metals will have headquarters during the Metal Congress at the Statler and the Hollenden hotels; the A.I.M.E. will be at the Statler, and the American Welding Society at Hotel Cleveland.

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service", The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

Recent U. S. Patents

STIFFNESS TESTING DEVICE, No. 2,338,338.
PRESS, No. 2,338,352.
CLUTCH FOR PORTABLE POWER DRIVEN TOOLS, No. 2,338,358.
SAFETY DEVICE FOR PRESSES, No. 2,338,364.
HOB, No. 2,338, 366.
WORM GEARING, No. 2,338,367.
VISE, No. 2,338,471.
GRINDING TOOL, No. 2,338,484.
POWDERED MATERIAL PRESS AND CONTROL No. 2,338,491.
GRINDING MACHINE, No. 2,338,509.
METHOD OF FINISHING GEARS BY SHAVING, No. 2,338,528.
LAPPING TOOLS, No. 2,340,383.
LAPPING TOOLS, No. 2,340,384.
LAPPING TOOLS, No. 2,340,385.
LAPPING TOOLS, No. 2,340,386.
EXPANSION RIVET No. 2,340,423.
COFFEE PLASTICS PROCESS, No. 2,340,426.
GAUGE, No. 2,340,428.
PLASTIC MATERIALS DISPENSER, No. 2,340,433.
METHOD OF REPAIRING MACHINE TOOLS AND SLIDE CONSTRUCTION THEREFOR, No. 2,340,450.
FORMING DIE, No. 2,340,472.
TAP AND DIE HOLDER, No. 2,340,477.
MULTISPINDLE AUTOMATIC LATHE, No. 2,340,538.
SAFETY DEVICE FOR MACHINE TOOLS, No. 2,340,547.
SAFETY DEVICE FOR MACHINE TOOLS USING PHOTOELECTRIC TUBES, No. 2,340,548.
RIVETING APPARATUS, No. 2,340,552.
ABRASIVE CUTOFF MACHINE, No. 2,340,553.
CLAMP AND SUPPORTING BAR FOR DRILLS, No. 2,340,572.
CRANKSHAFT GRINDING MACHINE, No. 2,340,602.
METAL ROLLING, No. 2,340,646.
MACHINE FOR BROACHING BEARINGS, No. 2,340,653.
GRINDING WHEEL DRESSER, No. 2,340,683.

(TO PAGE 164—PLEASE)



THIS *Low Cost* KRW PRESS WILL GIVE YOU ROUND-THE-CLOCK PRODUCTION AT *Lowest Cost*

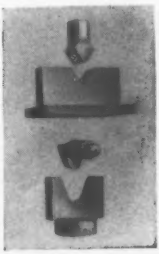
VARIOUSLY ADAPTED... EQUIPPED WITH THE PATENTED KRW SPEEDI-BOOSTER... AND USING INEXPENSIVE DIES ... IT DUPLICATES THE WORK OF HEAVY, HIGH-COST PRESSES AND BENDING MACHINES

● Even to the experienced production man, some of the work being turned out on various adaptations of the KRW Hydraulic Arbor Press is "eye opening." Literally by the thousands, KRW presses . . . in all types of war work . . . are doing the unusual and doing it at *lower cost*. This is especially true where short-run items are wanted fast.

The SPEED FACTOR in KRW Press operation results from the new patented SPEEDI-BOOSTER with instant fingertip control over ram head movement. Using low-cost dies ... made largely of ingenuity and welded or machined scrap steel ... any 25, 50, 60 or 75-Ton KRW Press can produce a wide variety of bending, forming and pressing. Using air pressure varying from 100 to 225 pounds, the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke . . . this is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation. We also manufacture suitable capacity air compressors. Write for fully-illustrated Hydraulic Arbor Bulletin. K. R. WILSON, 10 Lock Street, Buffalo 2, New York.

THIS MACHINE...MAKES THIS...WITH THESE SIMPLE DIES

This specially adapted version of the Standard KRW 25-Ton Press turns out these 5/8 CRS swivels in two operations, at high speed. Dies illustrated were welded and machined from scrap steel. Top set shown, form the two end bends as the first operation. Lower set, close the loop in final operation. Working position on the press is handy . . . worker fatigue is held to a minimum.



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SALES AND TECHNICAL LITERATURE

Send Request on Company Letterhead

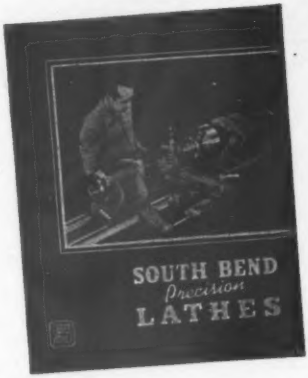
DECKER SPINDLE LATHE STOP is recommended for increasing production and obtaining a uniform product held to precision tolerances even while the lathe is operated by an unskilled operator. The Spindle Stop is easily and swiftly set up by adjustment of the nut which locks it in place. When set up in this way ,the work is successively chucked at the same depth. The Spindle Stops are made to fit both spindle and collet draw-bar for South Bend, Logan, Atlas, Sheldon, Clausing and Craftsman Lathes. Further information is available from the DECKER MFG. CO., Dept. TD, 756 Willow St., Chicago 14, Ill. **A96-N**

MAGNA-SINE — Both Magnetic Sine Table and Non-Magnetic Sine Plate, adaptable to a wide range of grinding and inspection operations are featured in a 4-page bulletin issued by ROBBINS ENGINEERING CO., Dept. J, 318 Midland Ave., Detroit 3, Mich. Available in two models and sizes the Magna-Sine is a magnetic sine table employed to hold a magnetic material at any required angle—either single or compound—for purposes of grinding, honing, lapping, machining, inspecting or checking flat surfaces, holes, bevels, chamfers, etc., which are at an angle in relation to the base surface. **817-N**

FOR GRINDER MEN ONLY is the title of a uniquely illustrated booklet published by the KOEBEL DIAMOND TOOL CO., Dept. J, 9444 Grinnell Ave., Detroit, Mich. Its pages briefly explain how a wheel should be dressed. Apparent variations in the characteristics of a wheel are often caused by inconsistent dressing. To insure a sharp cutting point at all times, longer wheel life and greater wheel efficiency, the booklet advises turning the diamond frequently. **565-N**

GREAVES REAMER DRIVER—This compact machine with foot control requires only a minimum of space and is illustrated in a leaflet issued by the GREAVES MACHINE TOOL CO., Dept. DJ, 2001-17 Eastern Ave., Cincinnati, Ohio. Its four changeable speeds include 30—45—72—115 rpm. Higher speed ranges are available on special order. **A76-N**

MODERN LATHES FOR INDUSTRY including Engine Lathes, Toolroom Lathes and Precision Turret Lathes for practically all types of production, toolroom and maintenance work are illustrated in Catalog No. 150 recently issued by SOUTH BEND LATHE WORKS, Dept. TD, South Bend 22, Ind. The Engine Lathes and Toolroom Lathes are made in five sizes



with 9", 10", 13", 14½" and 16" swing, and with bed lengths from 3' to 12'. The Precision Turret Lathes have 9" and 10" swing with ½" and 1" maximum collet capacity. To facilitate the use of this catalog, all information concerning capacities, speeds, feeds and dimensions are tabulated for each size and model of lathe. Considerable space is devoted to lathe attachments for special classes of work. **564-N**

POWERSTEEL—BY CROBALT, INC.—a cast high speed steel, poured directly into molds of the approximate tool shape required, is presented along with information about Crobalt, a cast non-ferrous high speed cutting alloy in a 24-page booklet issued by CROBALT, INC., Dept. D, 1354 N. Main St., Ann Arbor, Mich. Powersteel tools when cast, possess the desired grain and carbide particle

sizes. Not only are forging and hot working eliminated, but heat treatment need not be carried beyond the critical temperature of the metal. Crobalt is supplied in the form of either finished or semi-finished tools, cutter blades, tool bits, form tools, inserts for reamers and counterbores, and wear plates. New uses are being constantly developed. **107-N**

Universal Drill Bushings save valuable tool drills. Because they are straight and round and have

super-finished bores, Universal Drill Bushings insure accuracy and possess unexcelled wearing qualities. Tough, precision-made. Write today for further facts about Universal Drill Bushings, Collet Chucks, Floating Chucks and MIKRO-LOK Boring Bars.

UNIVERSAL ENGINEERING
FRANKENMUTH, MICHIGAN

MARVEL METAL CUTTING SAWS are illustrated in Catalog C43 issued by ARMSTRONG-BLUM MFG. CO., Dept. TD, 5700 Bloomingdale Ave., Chicago 39, Ill. Marvel Heavy Duty Hack Saws have almost unlimited power and sturdiness built into them. These machines will handle a wide range of sizes, shapes, hardness and grades of material at the lowest tool and labor cost. Oversize members, anti-friction bearings, heat treated tool steel, and other special materials all contribute a ruggedness and stamina that permits heavy, twenty-four-hour operation without danger of breakdown. **A83-N**

ANGLE GAGE BLOCKS and how to measure angles correctly with them are described in a 4-page folder issued by the WEBBER GAGE CO., Dept. T, 12903 Triskett Rd., Cleveland 11, Ohio. These Angle Gage Blocks are used for precision measurement of angles in the laboratory, inspection room, shop, etc. To obtain a desired angle, blocks are selected from the set which when added—or subtracted—will yield that angle. These blocks are wrung together and will adhere just as rectangular gage blocks. No mathematical computation is involved in using them as a table showing which blocks to use and how to combine them to get any angle required is furnished with each set. **621-N**

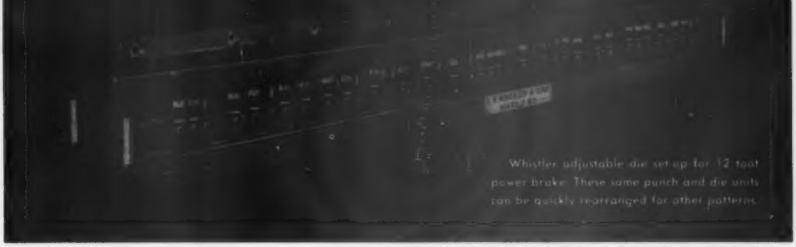
CIRCULAR RELIEF GRINDING which is accomplished by one operation on one machine and by using only one set-up is presented in a 4-page folder issued by the CLEVELAND TOOL ENGINEERING CO., Dept. J, 1261 W. 4th St., Cleveland 13, Ohio. A few of the many applications of this most modern method of performing an essential and formerly difficult operation are illustrated. This grinder generates the nearest approach obtainable to the ideal cutting edge for all tools within its range, thereby achieving increased production, lower unit cost, closer tolerance, exact duplication and longer tool life with, consequently, fewer shut-downs for regrinding. **A82-N**

VERTICAL MILLING & JIG BORING MACHINE — This high-speed machine presents new opportunities for handling a wide variety of die work, jig making, metal pattern and model making, drilling, reaming, milling — quickly, accurately and economically. • It is especially valuable in releasing the larger machines for work better suited to their capacities, and has the versatility essential to rapid changeover from one type of production to another. This information is contained in a 4-page illustrated bulletin issued by LINLEY BROS. CO., Dept. J, 662 State St., Bridgeport 1, Conn. **608-N**

YOST VISES are illustrated and described in Catalog 11 issued by YOST MFG. CO., Dept. TJ, 1000 Main St., Meadville, Pa. The Yost "Special" Machinists' Vise is recommended for all classes of work requiring a

ADJUSTABLE DIES
SPEED WAR PRODUCTION

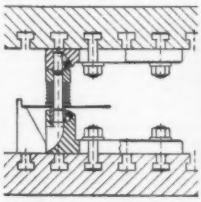
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

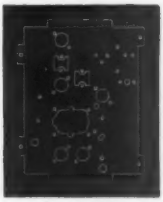


Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.

Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

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Every Production Executive needs this fully illustrated catalog. Sent upon request.

good substantial vise with a swivel base design that will hold securely in any position of a circle parallel with bench—a swivel base that will not slip nor show lost motion after continued severe use. A few of their other vises shown include the Yost Machinists' Vise, Toolmakers' Vise, Drill Press Vise, Combination Pipe Vise, Self Locking Hinge Pipe Vise and Utility Vise. **579-N**

ADJUSTABLE PERFORATING DIES are featured in Catalog 44 published by S. B. WHISTLER & SONS, INC., Dept. T, 752-756 Military Rd., Buffalo, N. Y. Standard sizes from 1/4" to 1½" punch diameters, in round, oval, square or rectangular shapes, are illustrated and priced. High precision on short or long runs is but one feature of these dies which work on practically any type press. They can be used over again in as many different groupings as desired—add or delete different sizes or shapes. **88-N**

DOUBLE-END END MILLS—Hi-Speed End Mills, Counter Bores, Reamers and Special Tools and Holders are illustrated in Catalog 3-A published by the PUTNAM TOOL CO., Dept. TJ, 2985 Charlevoix Ave., Detroit 7, Mich. Putnam Hi-Speed Heavy Duty End Mills with Hi-Power drive are designed and constructed especially for use in boring mills when large cuts and extra length of flutes are desired. Featured also is the Putnam Universal Grinding Fixture for sharpening End Mills. **A80-N**

DIE SETS and die makers' supplies are presented in the sixth edition of the DETROIT DIE SET CORPORATION'S catalog. Information on special die sets, toggle clamps, steel punch shanks, bushings, leader, dowel and shoulder pins, and socket head stripper bolts are included. Their flat rounded springs are designed to meet the requirements of the modern tool and die shop, the stamping and all sheet metal working plants. Numerous diagrams and specification tables are given. Address the company at Dept. TJ, 2895 W. Grand Blvd., Detroit 2, Mich. **674-N**

DI-MET RESINOID BONDED Diamond Abrasive Wheels are described in Catalog No. 43-3 published by the FELKER MFG. CO., Dept. D, 1111 Border Ave., Torrance, Cal. Because of their fast, free cutting action, the ability to remove stock rapidly, and the smooth surfaces produced, resinoid bonded wheels are generally recommended where these characteristics are of greatest importance. Operating instructions, specifications and diagrams of these diamond abrasive wheels are given. **132-N**

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Rawhide
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The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring... protects finished surfaces, machines delicate insulation and parts. Speed die-setting, assembly, no fatiguing re-coil. Reduce breakage and spoilage. Sizes and weights for every need.
C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.
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VARIABLE SPEED BAND SAWS
Are Metal-Cutting EXPEDITERS!

Removing gates and risers from steel, cast iron, manganese, bronze, hard and soft brass, aluminum and magnesium castings, as well as many other metal cutting jobs handled with great dispatch and surprising savings on TANNEWITZ VARIABLE SPEED BAND SAWS. And since they are available in any 3:1 speed ratio from 100:300 to 1000:3000 blade feet per minute, with instant adjustment to intermediate speeds, one machine serves ideally for cutting a variety of materials. Made with 30", 36" and 42" wheels.

Other models (single speed) for such purposes as sawing large blocks of aluminum and magnesium, cutting large steel templates, etc., are available in capacities and speeds to ideally accommodate work of practically any size or character. For complete facts write for bulletin on Variable Speed Band Saws. Also on request, bulletins on: Sheet Metal Cutting Band Saws; DI-SAWS, combination band saws for sawing, filing and polishing.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

of older style magnetic chucks, providing flexibility and adaptability that are not possible to obtain in the other types is presented in an illustrated booklet published by ROCKFORD MAGNETIC PRODUCTS CO., Dept. TD, 1022 6th Ave., Rockford, Ill. The principle of "Power-Grip" magnetizing develops intense holding power. It results in locking magnetically the work, the magnetic chuck and the parallel. Pieces such as rings and bearing races that may be subject to springing and distortion are held uniformly and firmly by means of the Rockford Power-Grip Magnetic Rotating Chucks. Work can be held for boring, facing and turning full length in one set-up. **A87-N**

EVANS AUTOMOTIVE REAMERS are illustrated in a 4-page catalog and price list issued by EVANS REAMER & MACHINE CO., Dept. TD, 526 S. Main St., New Lexington, Ohio. These reamers, possessing chrome-plated cutting edges, ream equally as well in cast iron, steel, brass or aluminum. Right and left spiral blades make it possible to ream bores with keyways, oil grooves, slots or split bushings. **733-N**

HOLE CUTTING TOOL with adjustable self-clamping legs is illustrated in a circular issued by T. & H. MFG. CO., Dept. J, 811 E. 31st St., Kansas City 3, Mo. Inserted in a drill press this tool cuts circular holes from 1½" to 8" diameter in metal, plastics, wood, etc., without the use of clamps to hold material. The six legs equipped wih slip-proof pads are held down on material by strong spring pressure, holding material firmly in place without clamps unless an exceptionally heavy cut is made. **A88-N**

KALAMAZOO BAND SAW cuts anything that will go into the throat, states an 8-page booklet issued by the KALAMAZOO TANK & SILO CO., Machine Tool Div., Dept. D, Kalamazoo, Mich. This metal cutting band saw has 12 outstanding mechanical features which include hydraulic frame control, quick acting vises, automatic feed, four speeds, blade guides, motor and tension spring. The Kalamazoo coolant system permits high speed cutting on the Kalamazoo metal cutting band saw. It is especially desirable in making heavy cuts on extremely hard metal where there is excessive heat generation. **A-89N**

ADJUSTABLE DRILLING HEADS—Linderme sturdily constructed Two Spindle Adjustable Drilling Heads are made in two types as illustrated in a 4-page folder issued by the LINDERME MACHINE & TOOL CO., INC., Dept. T, 12250 Coyle Ave., Detroit 27, Mich. Each type is available in a variety of sizes, suitable for use with large or small drill presses. "A" and "B" Models are made with a "sleeve" adaptor, for fitting to individual drill press quills, according to specified re-

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AN INNOVATION . . . PROVIDES COMPLETE PROTECTION WHILE GRINDING

Prevents operator getting fingers, or dropping tools, into cup of wheel.

New safety cup disc, now standard equipment, is the greatest safety unit ever installed on any carbide tool grinder. It is an integral part of cup wheel hood design, adjustable for wheel wear. Before you buy a carbide tool grinder . . . investigate . . . compare! Hammond's complete line, from chip breakers to 20" grinders, gives you complete facilities for carbide tool maintenance.

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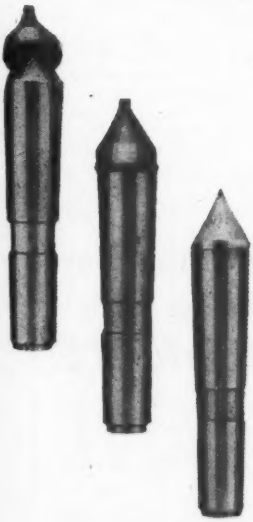
HARD FACING ALLOYS AND OVERLAY METALS

COMPLETE
Lathe and Grinder Center
RETIPPING SERVICE



In addition to supplying COLMONOY Center Tips, we are now in position to provide complete retipping service on centers.

This service consists of casting tips of COLOMONY NO. 6 and applying them to your centers by the use of Silver Solder or a low temperature brazing alloy. By the use of this method your worn or used high speed steel centers can be salvaged, and such reclaimed, COLOMONY tipped centers will outlast and outwear new, untipped centers.

Charges for this work are moderate. For full information, covering prices of tips as well as application by us, write for Bulletin CT-1.

OFFICES

Detroit, New York, Blasdell, N. Y., Chicago, Tulsa, Los Angeles, San Francisco and in Canada.

WRITE FOR LITERATURE

In addition to Bulletin CT-1, mentioned above, we shall be glad to send you our General Catalog No. 75, covering the complete line of Colomony Hard Facing Alloys, and illustrating typical applications.

WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit 2, Michigan

quirements. "C" and "D" Models are made with an "overarm" adaptor, equipped with guide pins, springs, and brackets, mounted to a 12" x 14" x ¾" cast iron base, with surfaces ground, on which drilling fixtures may be used. **A85-N**

"UTILITY" PNEUMATIC GRINDER. Model U-TR, designed for real production and tough jobs requires no manual or automatic lubricating. The spindle is of extra heavy construction, a special alloy steel being used, heat treated and ground to close limits. Accessories furnished include a 7' flexible air hose fitted with dirt filter, 2 drop forged wrenches, and four mounted grinding wheels all packaged together with grinder in solid oak case. Bulletin No. 1002 is available from M-B PRODUCTS, Dept. J, 130-134 E. Larned St., Detroit 26, Mich. **A86-N**

TUNGSTEN CARBIDE BLANKS available in four standard and many special grades for wire and tube drawing dies, turning tools of all sizes, bushings for ring gages, plug gages, drill points, measuring anvils, blades for cutters and reamers, rests for centerless grinders, wear plates and pilots, lathe centers, boring tools and guide rings are described in an 8-page catalog issued by the ADAMAS CARBIDE CORP., Dept. D, 40-30 23rd St., Long Island City, N. Y. Grades A and B are suitable for cast iron, bronze, aluminum, magnesium and plastics. Grades C and D are recommended for practically all types of ordinary and alloy steels. **A81-N**

CENTRIFUGAL PUMPS to meet today's exacting demands are described in Catalog P-600 published by the LOMBARD GOVERNOR CORP., Dept. D, Ashland, Mass. Lombard builds for the Navy and the U. S. Maritime Commission. For handling hot and volatile liquids, this company has developed a single stage double suction medium-head pump that gives superlative performance. Like other Lombard pumps, the casings embody advanced engineering for liquid flow; the rotors are dynamically and statically balanced; and ample size parts contribute to long life and low maintenance costs. **373-N**

UNIVERSAL JOINTS, precision ground aviation type, are illustrated in the 1944 Catalog of the DIX MFG. CO., Dept. J, 3447 E. Pico Blvd., Los Angeles 23, Cal. This book is prepared as a ready reference for the designer, engineer, purchasing agent or anyone who has to do with universal joints or their procurement. Dix Joints are available in 15 standard stock sizes of Aviation Type Universal Joints and many other special types and sizes can be furnished according to customer's requirements. Instructions for mounting universal joints are included along with information concerning the Dix-Wilder improved multiple carriage stop. **784-N**

SPEED punching and SAVE belting with MASTERDRIVE

How it speeds—High torque, high slip motors pick up the load with minimum shock. No slipping. Gear head motor reduces output shaft speed, permitting a large motor pulley and a high percentage of belt wrap.

How it saves—Use your present belting. Save rubber, and expense and delay of grooving pulleys. Belt failure will not capsize drive.

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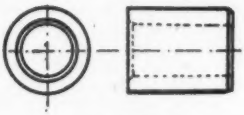

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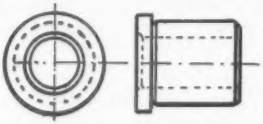

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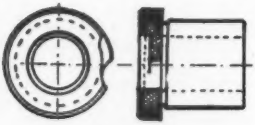

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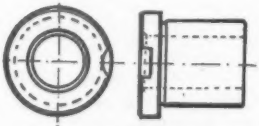

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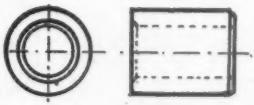

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SELECTIVE SPEED TRANSMISSIONS for all types of machines are shown in an 8-page catalog issued by DRIVE-ALL MFG. CO., Dept. TD, 3400 Conner Ave., Detroit 14, Mich. Typical Drive-All lathe, milling machine and shaper installations are featured. Right and left hand output is available in each transmission and a large variety of especially designed brackets make Drive-All adaptable to and easily installed on any machine in approximately two hours. A convenient shifting lever selects the speeds needed for various types of machines and work. **570-N**

GRINDING WHEEL FACTS are presented in a 74-page booklet issued by BAY STATE ABRASIVE PRODUCTS CO., Dept. T, Westboro, Mass. Among the subjects covered are controlled porosity, standard types of grinding wheels, fractional grades, Bay State Bonds and standard shapes of grinding wheel faces. Recommendations for using metal bonded diamond wheels used for offhand grinding and lapping of cemented carbide tools, glass, quartz and ceramics are given. **205-N**

BENCH PUNCH PRESS of 4-ton capacity and equipped with the special J & H Non-repeating Clutch is featured in a leaflet issued by the JONES & HENRY TOOL CO., Dept. TD, 2146-50 Santa Fe Ave., Los Angeles, Cal. This press is properly engineered and built for stamping, punching, marking, crimping, riveting and many other operations where both economy and trouble-free production are required. It is mounted on an adjustable cradle which allows the machine to be inclined and has a large heavy frame cast in one piece, fully reinforced where strain is great. **A79-N**

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"SPEEDAIRBONDS"—A group of air-drying, insulating varnishes, designed for use in the manufacture and repair of electrical equipment are presented in Bulletin 243 released by the STERLING VARNISH CO., Dept. T, 174 Ohio River Blvd., Haysville, Pa. These Speedairbonds are claimed to be the outstanding air-drying varnishes in the electrical insulation industry. They dry exceptionally fast to a smooth, glossy finish—are oil-proof and extremely water, acid, and alkali resistant—possess highest dielectric qualities—their flexibility and long life are unparalleled. **A77-N**

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VULCAN FURNACES are illustrated in a 4-page folder available from the VULCAN CORP., Dept. J, 18th & Cherry Sts., Philadelphia, Pa. Various types including the Stress Relief Furnace, Car Hearth Furnace, Salt Bath Furnace, Annealing Furnace and atmosphere Gas Furnace are shown. Their design and construction assure uniform heating, accurate control and a faster cycle. **665-N**

TAMALOY CARBIDE TOOLS are featured in Catalog T44 released by the TUNGSTEN ALLOY MFG. CO., Dept. TD, 65 Colden St., Newark 4, New Jersey. Tamaloy lathe and grinder centers are tipped with a special grade of hard-wearing, non-galling carbide that lasts fifty to a hundred times as long as high speed steel and eliminates the need of frequent regrinding. **750-N**

SPENCER SUMP-VAC which cleans sump tanks in 2 to 10 minutes is illustrated and described in Bulletin No. 130 published by the SPENCER TURBINE CO., Dept. TJ, Hartford 6, Conn. The tank which has a capacity of 125 gallons can be emptied by gravity in two minutes. No priming is necessary and all material in the sump tank is cleaned out by air vacuum after the liquid is removed. **469-N**

WHEELCO THERMOCOUPLE DATA BOOK and Catalog, Bulletin S2-4, contains 36 pages of descriptions of products, prices and recommendations for thermocouple users, and suggests substitutes for restricted materials. It gives data on selection of thermocouples, lead wire, protecting tubes, heads and insulators. Also carried are temperature conversion tables, millivolt tables, and tables on pipe and wire sizes, decimal equivalents and wire resistances. Instructions are given on checking thermocouples and pyrometers and on construction of thermocouples. This bulletin is available from WHEELCO INSTRUMENTS CO., Dept. D, Harrison & Peoria Sts., Chicago 7, Ill. **72-N**

REAMERS & BORING BARS are described in a highly illustrated Catalog No. 44 recently published by the WETMORE REAMER CO., Dept. T, 418 N. 27th St., Milwaukee 8, Wis. Free cutting, absolutely smooth holes, with no scoring by the reamer while backing out after the cut, are the results of the perfected

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Wetmore Reamer design. One of the features of Wetmore Boring Bars is their locking device which locks tool solidly and positively without changing its setting. This eliminates breakage and prevents shifting of tool under load. Numerous tables and data giving general instructions are included. **838-N**

GRAVITY FEED OILERS are illustrated and described in Bulletin No. 26-B issued by TRICO FUSE MFG. CO., Dept. J, 2948 N. 5th St., Milwaukee 12, Wis. This modernized, streamlined Oiler with its crystal-clear, reinforced plastic reservoir that is 50% lighter in weight, has no gaskets to leak. The dust-proof style has an oil filter that can be removed for easy cleaning in less than five seconds without tools, mess or waste of time. **A78-N**

SAFETY GUARD PROTECTION—The Junkin Triple Interlock Safety Guard, designed to protect the operators of stamping presses, is featured in a booklet issued by the JUNKIN SAFETY APPLIANCE CO., Dept. J, 930-36 West Hill, Louisville, Ky. The device provides an efficient point of operation protection and incorporates several safety features which have proven to be essential to proper press guarding. **343-N**

LOW TEMPERATURE UNIT COOLERS without frost accumulation problems are illustrated in Bulletin 440 published by the VILTER MFG. CO., Dept. T, Milwaukee 7, Wis. Available for any refrigerant, these units can be used for any low temperature duty where frost accumulation is a problem—any room temperature can be maintained within 10° of any refrigerant temperature. A maximum defrosting time of 20 minutes each day insures the utmost in efficiency. The units can be furnished with three-speed motor controls to provide for lower velocities for periods of loading and loading out when employee occupancy of the room is necessary. **A75-N**

DUAL MANIFOLD LUBRICATION SYSTEM is described in an illustrated brochure issued by the STEWART-WARNER CORP., Alemite Div., Dept. D, 1824 Diversey Parkway, Chicago, Ill. The Alemite Dual Manifold System is well suited to medium and heavy duty machines. It will serve practically an unlimited number of bearings from a central point and is the answer to centralized lubrication of large groups of machines. It is ideally adapted to the handling of a wide range of petroleum products, from light oils to heavy greases, under extremes of heat or cold. **581-N**

INDUSTRIAL TABLET COMPRESSING MACHINES are featured in an illustrated Catalog, 41-T, published by F. J. STOKES MACHINE CO., chemical, pharmaceutical and special process machinery manufacturers, Dept. T, Philadelphia 20, Pa. Stokes tabletting machines have been developed to meet specific

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WELTRONIC FOLDER—Bulletin No. 75-51-50 issued by WELTRONIC CO., Dept. TD, 20735 Grand River Ave., Detroit 19, Mich., gives features, specifications and functions of the Weltronic Synchronous Resistance-welder Control, Model No. 75-51-50. This particular model, which is fully automatic, all electronic, precisely synchronous, and continuously adjustable, has been designed to permit complete control of operations on spot welders using air or hydraulically actuated electrodes, with solenoid operated valves. **931-N**

ELECTRIC GRINDERS & BUFFERS are illustrated in Catalog No. 70 published by the HISEY-WOLF MACHINE CO., Dept. TD, Cincinnati 25, Ohio. Attachments and accessories for Hisey Grinders and Buffers include illuminating shields which, when furnished with machine, are wired so that they automatically light when machine is started. Tapered Extension Spindles, Wheel Dressers, Safety Taper Flanges and Dresser for Disc Grinders are also described. **542-N**

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SPECIAL EQUIPMENT including Surface Plates, Angles, Parallels, Vee Blocks, Straight Edges, Cylinder Squares and the Rotab are featured in a new catalog issued by MACHINE PRODUCTS CORP., Dept. J, 6771 E. McNichols Rd., Detroit 12, Mich. Their surface plates, cast of Meehanite, resist deflection under load and retain their accuracy due to a special form of ribbing that supports them. The Rotab simplifies machining or checking and possesses sturdy bearings to hold position. The face plate can be rotated to any degree and adjusted to any angle from the vertical to the horizontal position and to 30° below the horizontal the opposite way. **144-N**

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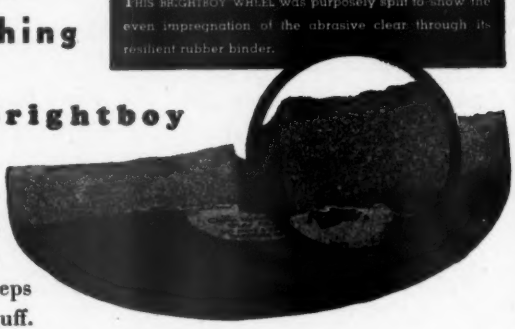

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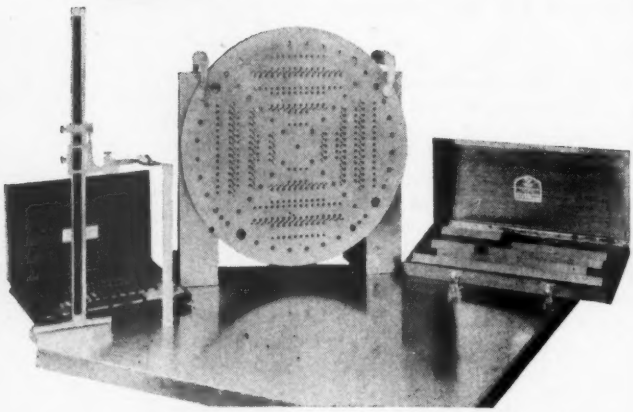

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and BOOK REVIEWS

HANDBOOK OF PLASTICS, now in its fifth printing, is the "bible" of the plastics industry. The encyclopedic scope of the work places this work in a class by itself. Following the plan laid down by Carleton Ellis, Herbert R. Simonds, consulting engineer and technical editor of "Plastics World", and M. H. Bigelow, Capt. C. W. S., Army of the United States and formerly head, Technical Service Division, Plaskon Co., Inc., with the aid of a staff and an advisory committee which included a number of leaders in the industry, have produced a monumental work. The twenty-six chapters are divided into eight parts, a ninth part includes the appendix, glossary and bibliography.

In spite of the bulk of the Handbook (XXVIII, plus 1,082 pages) data is easy to find thanks to excellent indexing and a detailed table of contents. The balance of the Handbook is as impressive as its completeness. The book abounds in tables, charts and lists of suppliers, materials, trade-marks and trade names.

Part 1 is a survey of the industry; part 2 has three chapters on physical properties of plastics; part 3 has eight chapters on materials; part 4 has two chapters on manufacture of plastics (one on processes, one on plant equipment); part 5 has four chapters on processing and fabrication (one on molds and one on equipment for molding plants); part 6 has two chapters on chemistry of plastics; part 7 has two chapters on applications (one on designing molded plastics parts); part 8 has four chapters on commercial considerations (one on estimating and paper work); part 9 has been noted above.

The Handbook is a necessity for any worker in any phase of the plastics industry. It is unquestioned as the number one authority. It sells at $10.00, postage paid on orders accompanied by remittance. It may be ordered from Cleworth Publishing Co., Inc., Dept. D, 551 Fifth Ave., New York 17, N. Y.

PLASTIC HORIZONS, a unit in the Science for War and Peace Series, is a very elementary approach to the entire plastics field. Five chapters give the "once-over-lightly" to the chief materials, the position of the plastics industry, plastics at war, synthetic fibers and rubbers and some probing into future possibilities. Written by B. H. Weil and Victor J. Auburn, both of the Gulf Research and Development Co. for the non-technical reader, the book is well planned with sufficient data given to justify attention from many persons in the plastics industry as well as many who wish to get a few fundamentals straight. The brief attacks on organic chemistry, the notes on groups of materials, the raw material sources and war applications are noteworthy. The last chapter is devoted to a discussion of the postwar possibilities of plastics—the home, the automobile, the plane, home furnishings, business and industrial applications. There is also a list of materials, trade names and manufacturers. This is a book that should be in the hands of executives in companies whose technical men are convinced that plastics will play a part in their business or industrial future. The book is published at $2.50 by the Jacques Cattell Press, Dept. J., Lancaster, Pa.

PLASTICS IN ENGINEERING, the second edition of this excellent technical survey incorporates many new materials, equipment, methods and applications made imperative by the rapid growth of the whole range of techniques of plastics. The principal value of the book is that it consistently follows a well established plan and achieves in effect, the distinction of being the first standard engineering handbook in plastics. The serious lay reader as well as the engineer eager to absorb sound approaches to plastics techniques will be well repaid by the relatively large portion of the book which is devoted to design, both of products and of molds. An entire chapter is given over to the limitations of the common plastics materials. Such chapters as Properties of Plastics, Styling the Machine with Plastics and those on nonmetallic bearings, gears and cams are definitely sound engineering approaches instead of ghosts of manufacturers' and material suppliers' literature. The chapter on test methods is an ex-

cellent summary. The author, John Delmonte, is Technical Director, Plastics Industries Technical Institute. "Plastics in Engineering" is a worthy unit in the Machine Design Series published by Penton Publishing Company, Dept. D., 1213 W. 3rd St., Cleveland, Ohio. Published at $6.00, this is one of the books that every plastics technician acquires as a matter of course.

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A DICTIONARY OF METALS AND THEIR ALLOYS, edited by F. J. Camm, is a book which includes information about every known metal and almost every type of commercial metallic alloys, their composition and characteristics.

In addition, there are special sections on hardening, case-hardening and tempering, electroplating, polishing, chemical coloring, metal spraying, rustproofing and useful tables.

Mr. Camm is editor of "Practical Engineering," and several other publications. In his preface to the Dictionary, he says: "As far as I am aware this is the first alphabetically arranged Dictionary of metals and their alloys yet published. With an ever-growing list of new alloys having special properties and intended for particular uses, it is important that engineers should have at hand an easily consulted book which gives the analysis and characteristics of all of the known metals". The book is adequately cross-referenced throughout, and, where necessary, historical facts have been included. Many special alloys today are merely known by numbers and/or letters. These references have been excluded, but in all cases the general type of alloy to which they belong has been included.

Published by The Chemical Publishing Co., Inc., 26 Court Street, Brooklyn 2, N. Y., and priced at $3.00.

EVALUATING APPRENTICES: This 20-page booklet meets a long-felt need for technical advice on how to determine the cost of training apprentices, as compared with the value of their production while in training; as well as how to record the skills apprentices acquire as they advance from one step of their training to the next. It has been prepared especially for training directors and others responsible for apprentice training. These pertinent questions are discussed comprehensively from the practical standpoint in two fact-finding articles contained in the booklet, entitled respectively "Cost of Training and Value of Production of Apprentices" and "Apprentice Record Cards".

Copies of this booklet may be obtained by writing to Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C.

GRINDING WHEELS AND THEIR USES — This is a second printing of the second edition of a handbook and textbook on modern grinding practice and theory by Johnson Heywood under the auspices of The Grinding Wheel Manufacturers Association.

This second edition contains much new material, including several additional chapters. Where older methods have been improved the old descriptions have been

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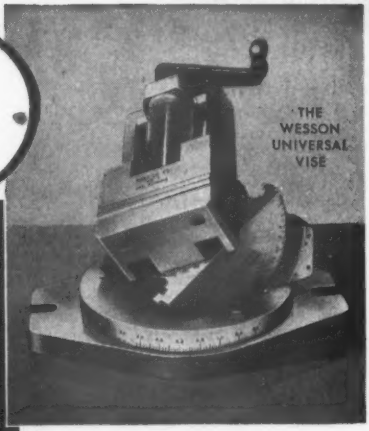

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710 Fisher Bldg., Detroit 2, Michigan

Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

Name and Title.....

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dropped and descriptions of the new ones substituted.

More stress has been laid on typical ingenious knacks for solving difficult grinding problems, and on designing parts to permit their being ground instead of machined by other methods when grinding will produce a better product, or will increase production, or decrease costs—as it usually will.

It was originally hoped that the book would serve, first, as a handbook on modern grinding practice to which shop executives would turn for help on everyday grinding problems; second, as a textbook for workmen who were, or hoped to become, grinding machine operators; and third, as a textbook in apprentice and other trade schools and technical colleges. Unsolicited letters of favorable comment indicate that this aim has to a considerable extent been achieved.

The book is well illustrated with photographs and drawings, is of 436 pages, and contains many tables, in addition to a comprehensive index and trade name glossary.

Published by The Penton Publishing Company, Dept. D., Cleveland, Ohio. Price, $3.00.

"PRACTICAL DESIGN FOR ARC WELDING", the first eight loose-leaf design sheets of a series planned to include 100 sheets are being distributed by The Hobart Brothers Co., Dept. T., Troy, Ohio. Prepared by Robert E. Kinkead, consulting engineer on welding, the designs are for the designer already familiar with the fundamentals of arc welding and take up the subject of design where the Hobart book, "Practical Arc Welding—A Text Book", left off. The factors which limit the choice of design are given by Mr. Kinkead in an introduction. He states that the purpose of the series of sketches is to suggest additional and tested ideas to the designer with a specific problem before him. In some cases several solutions to the same problem are shown but no claim is made of exhaustive treatment. Every design shown has been put to use. The first eight sheets are titled "Light Machinery Base Corners", "Taper Cantilever Beams or Columns", "Stiffeners for Light Sheet Metal Construction", "Built Up Beams to Save Weight", "Platforms", "Machinery Frame and Bearing Blocks", "Lattice Bars Crane Boom" and "Ship Ventilator and Wind Scoop". There is an accompanying sheet showing Arc and Gas Welding Symbols. The plan of The Hobart Brothers is to issue the design data in series of eight sheets. The first eight sheets will be sent to shop and department heads, engineers and technicians on requests directed to The Hobart Company. **B3-N**

GAGES, THEIR USE AND CARE, an 80-page, pocket-size handbook on the use and care of the standard precision gages has been

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The deep elliptical ribbing, exclusive on all Smith plates, assures a maximum of rigidity, a minimum of deflection and long retention of accuracy.

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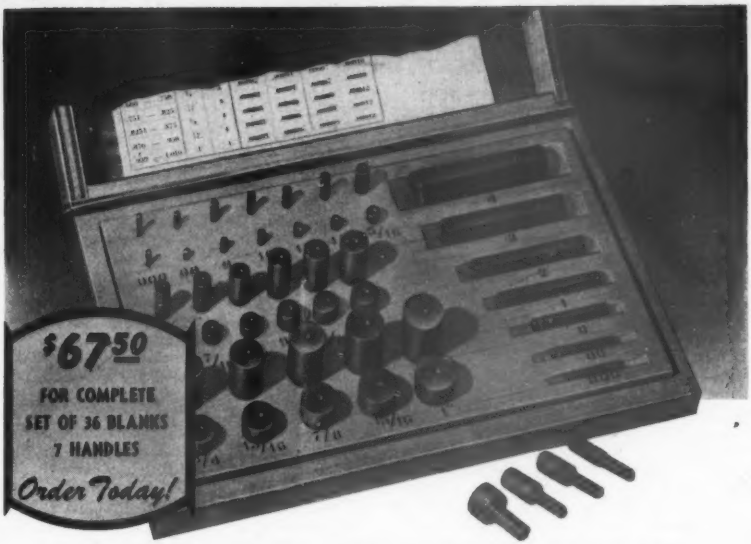
Smith Master Surface Plate and Stand



A BRAND NEW AND TIMELY SOLUTION TO YOUR GAGE PROBLEMS

Make your own PLUG GAGES quickly and at low cost with ATLANTIC EMERGENCY SETS

Any toolroom or shop equipped with a grinding machine capable of holding work to one or two tenths of a thousandth can quickly make up any size go- and no-go gage in a few minutes at a fraction of the usual cost of a finished gage—with the NEW ATLANTIC EMERGENCY SET of cylindrical plug gage blanks. Our mass production and modern heat treating methods enable us to produce in large volume and save you money over what it costs you to make up your own blanks a few at a time.

With the 36 blanks in steps of $\frac{1}{16}$" with handles in the complete ATLANTIC SET, you can make any size plug gage from .029" to 1.000". Only the O.D. must be finished by grinding when commercial finish is required. For gages of high standards, lapping is, of course, also necessary. Blanks are oil hardened to ample depth to permit regrinding to smaller sizes when gages wear.

To cover your emergency needs most adequately, we recommend the purchase of the complete set. However, we can supply blanks singly or in quantity from stock in any size shown in the set. Prices on application.

Order an ATLANTIC EMERGENCY SET today—and be prepared for any rush job that comes into your shop.

Specifications

BLANK MATERIAL—Non forming, oil hardening tool steel.
HEAT TREATING—Blanks hardened and drawn to Rockwell C-61-63. Taper Shank hardened, drawn and ground.
FACE—Polished for marking surface; square with O.D.
CENTERS—Clean, true 60° lapped bearing surfaces and of uniform depth; concentric with O.D. to within .003.
MALE CENTERS—60° concentric with O.D. to within .0005.

Scherr Comparitol and Gage Blocks are used to check plug gages. Send for complete details of these inspection tools.

GEORGE SCHERR COMPANY, INC. 200-B LAFAYETTE ST., NEW YORK 12, N. Y.

issued by Vard, Inc., Pasadena 8, Calif. Grinding, inspection and packaging for shipment are illustrated from the respective Vard departments. Most of the standard types of plug, ring, thread roll snap, are described and illustrated. Tables on cylindrical plug and thread gage tolerances are given. Of particular value to the shopman will be the approved techniques of the use and care of snap gages, thread ring gages, plug gages (both cylindrical and threaded), and pipe plug and ring gages. A section on the care of gages is short but excellent. It should be read by every worker who uses gages. Trigonometric formulae and sine tables complete the data.

STEWART VEST POCKET HEAT TREATING DATA BOOK contains condensed specification of S.A.E. and N.E. steels, typical heat treatments of S.A.E. steels, and of common tool and die steels. Specifications on rotary hearth, semi-muffle oven, basket recirculating, vertical H.S.S. hardening and pre-heating furnaces are given. Allied technical tables and information, including melting points and weights, temperature and hardness conversion tables and composition hardness are included. Copies of the Data Book are available on request. Address Stewart Industrial Furnace Div. of Chicago Flexible Shaft Co., 5603 W. Roosevelt Road, Chicago 50, Ill.

ALCOA ALUMINUM AND ALUMINUM ALLOY STANDARD SCREW PRODUCTS, a 60-page ring binder catalog lists specifications of machine screws, bolts, nuts, washers and rivets manufactured by the Screw Machine Products and Rivet Divisions of Aluminum Company of America, Dept. D, Pittsburgh, Pa. American National fine thread and coarse thread series of machine screws in a variety of finishes are listed. Items marked "stock" are available in quantity from authorized Alcoa distributors. Bolts, nuts and washers are listed in another section and rivets of all types in still another section. Dimensions and weight tables are included to assist the purchaser to order accurately. Tables of typical mechanical properties of wrought aluminum alloys, average ultimate shear strength for driven rivets, government specifications for standard screw machine products and government specifications for standard rivets. A section on limiting dimensions of American National coarse and fine thread series and a list of Army-Navy Aircraft standard parts drawings add to the reference value of the catalog. Copies of Alcoa Standard Screw Products catalog may be obtained by request made to the manufacturer. **75-N**

INFLAMMABILITY AND EXPLOSIBILITY OF POWDERS USED IN THE PLASTICS INDUSTRY—published as Report of Investigations 3751, Bureau of Mines, Department of the Interior, is a comprehensive study of 57 powder samples made to supply information needed to prepare a safety code for the prevention of dust explosions in the plastics industry. The study was conducted by Irving Hartman and John Nagy, senior physicist and associate physicist respectively, of the Bureau of Mines, Central Experiment Station. The powder sam-

Gairing
TOOLS
Counterbore Sets
A kit of these efficient tools eliminates costly delays in counterboring and spotfacing. Seven sets from which to choose. Each contains a logical selection of interchangeable counterbores, pilots and holders. *Write for prices and Bulletin C.*
Set C-13, below, consists of 2 holders, 20 cutters ranging from 9/16" to 1¾" and 28 pilots ranging from 9/32" to 1⅛". Two countersinks, ⅞" x 70° and ⅞" x 82° are included, all neatly boxed with hard wood cover.
THE GAIRING TOOL CO., Detroit 32, Michigan

GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE

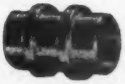
Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Inner Bearing Ring "Accurately removes last tenth" of stock."

Saved time in producing a smooth accurate finish on this bronze remote control valve body.

Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

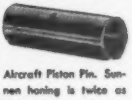
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

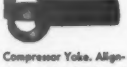
Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Bearing. A very small part. 2 micro-inch finish necessary.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.



Compressor Yoke. Alignment maintained and better finish produced.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

The Sunnen Precision Honing Machine is now furnished with a larger base containing a coolant pump, which provides a constant flow of honing fluid to the part being honed. The fluid acts both as a coolant and a lubricant, giving better honing properties to the abrasive. You get a smoother finish, more accurate work in less time.

Consider These Advantages, Too

- Hones and finishes internal cylindrical surfaces from .185" to 2.625"
- Can be used in any metal or plastic except lead or babbitt
- Does not require skilled labor
- Accuracy within .0001" guaranteed
- No jigs or fixtures needed
- Economical to operate
- Quickly and easily set up

Write today — for bulletin giving complete information.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY, 7947 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

ples included 31 resins, 15 molding compounds, 4 synthetic resin ingredients and 7 fillers for molding compounds. Tests were standardized on 200-mesh (Tyler scale) or finer sizes. Tests were made on minimum ignition temperature, relative inflammability of dust clouds, minimum explosive concentration, minimum energy required for ignition, maximum pressure and rate of pressure rise and tests in inert gases. Tables and charts give detailed results of all tests. Special tests were made on several powders to determine the rate and extent of moisture absorption when exposed in a humid atmosphere. The study was similar to one made previously on numerous metal powders. The study was undertaken to provide information for a subcommittee of the Dust Explosion Hazards Committee of the National Fire Protection Association. This Association will prepare and publish a safety code for the prevention of dust explosions in the plastics industry.

BASIC AIRPLANE MECHANICS, by H. G. Lesley, Superintendent of Maintenance, Eastern Air Lines, is a practical book covering facts and procedures which the airplane mechanic must know in order to keep planes in good working order. It deals with the theory of flight, tells in a brief, understandable manner the principles of airplane construction, and analyzes materials used in construction and structural repairs. Basic Airplane Mechanics explains the fundamental principles of operations of the hydraulic system, the understanding of which is so necessary for advanced trouble shooting. Mr. Lesley describes the troubles that might arise in the brake system and shows how to service brakes to keep them in perfect operating condition. Electrical instruments which we use in airplanes are listed and described, starters are thoroughly covered and the fundamental principles of alternating current and storage batteries are explained. The text is beautifully illustrated with many perspective drawings, photographs and cross-sectional drawings of parts, accessories and components.

The book is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., and sells for $2.50.

"THE METRICATOR"—a circular illustrating precision gaging equipment has been published by METRICAL LABORATORIES, INC., Dept. TD, 417 Detroit St., Ann Arbor, Mich. The advantages of the Metricator, which is an air operated precision gage for measuring internal and external diameters and tapers, narrow grooves, straightness and concentricity, include extreme sensitivity, assurance of full tolerance throughout gage life and freedom from the element of human error. **884-N**

SAVE TIME

ON BORING-TOOL SETTING

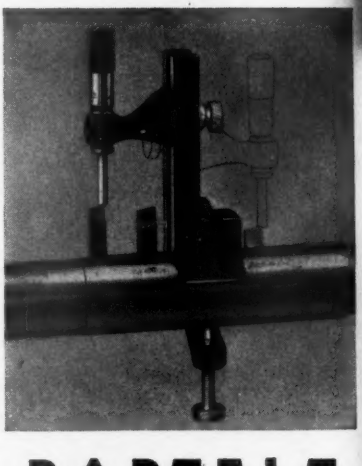
Take *one* trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position without a trial cut.

USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

USEFUL FOR MANY OTHER JOBS

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



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Diamonds?

Get a selection from Wheel Trueing's big stock . . . choose those you want and get exactly the kind of diamonds you prefer.

While the introduction of highly specialized engineered diamond tools (which Wheel Trueing pioneered) has done much to change buying habits, there are still plenty of diamond-wise production men, purchasing agents and heads of grinding departments who thoroughly understand the characteristics of diamonds, who are competent buyers and who still prefer to select unmounted stones.

Many of these experienced buyers have bought their diamonds from Wheel Trueing for a third of a century or more and in many instances leave the selecting of diamonds for their needs entirely in the hands of Wheel Trueing.

With Wheel Trueing sales offices located strategically throughout the country, it is an easy matter for us to get diamond assortments to you for your inspection and selection and you will find in every Wheel Trueing diamond assortment, the high quality that results in worth-while production economies.

Your inquiry will receive prompt attention.

Send for a copy of our booklet "Tips on Using Diamond Tools." You'll want copies for all your operators.

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and Save

1 Time
2 Money
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THIS DIE IS MADE OF 4 TOOL STEEL TUBES

The blanking and drawing die shown above was made of BISCO tool steel tubing at a fraction of the cost of forging rings or boring solid bars. Why not let us give you more information on this subject?

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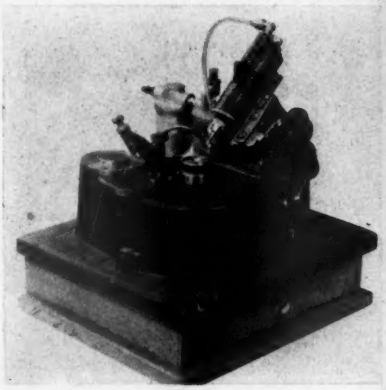
Valve Seat Grinder

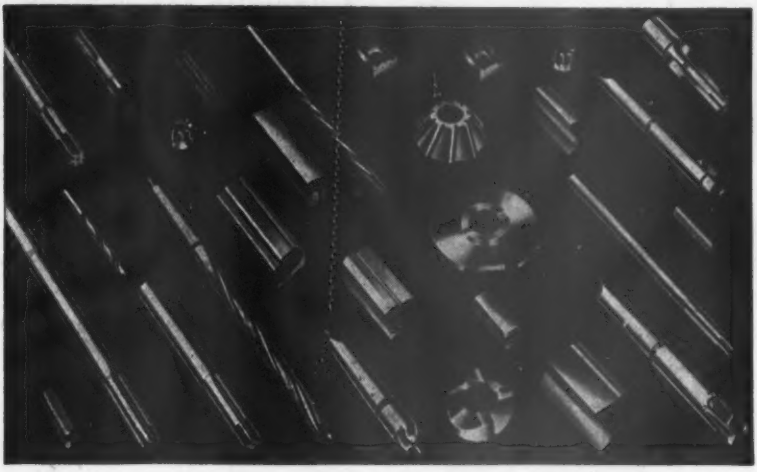
A precision valve seat grinder to replace the hand lapping of the needle valves and valve seats in the fuel injection system of Diesel engines was developed in the laboratory of The Cooper-Bessemer Corporation, Dept. TD, Mount Vernon, Ohio. Carl Mahaffey, development engineer, designed and completed construction of this grinder after many months of experimentation. The performance of the grinder has enabled these valve seats to be turned out in quantity and with such precision that hand lapping is unnecessary.



The machine is powered by two air motors, one to drive the grinding tip and one to rotate the valve seat. In the illustration the driving motor is mounted at the angle of the seating surface of the valve base. The valve seat motor is enclosed under the top plate at the left. The valve seat, held beneath the knurled chuck immediately in line with the grinder shaft, is turned in the opposite direction to the grinding motion.

An unusual feature of the valve seat grinder is the tool dressing point which is made a part of the unit. The diamond point tool dresser can be swung around into contact with the grinding tip when dressing is necessary. The driving air motor is of conventional design and is lubricated by a filter feed attached to the air line. The compressed air connnection, note in illustration, is

(TO PAGE 162—PLEASE)



THESE TOOLS ARE *Super Specials!*

DO you have any production jobs that require special cutting tools? If so, consult Super Tool Company. For Super Tool engineers have the engineering knowledge, the actual production experience and unexcelled plant and laboratory facilities to properly analyze your requirements and to design and build special carbide-tipped tools that will bring you maximum efficiency and money-saving economy.

Super Tool Company manufactures carbide-tipped tools exclusively—and has done so for many years. These years of experience, research, development and improvement are your assurance of complete satisfaction when you use carbide-tipped tools bearing the Super Tool Company name.

Whether you are cutting cast iron, steel or non-ferrous material, if you want speedy production, long tool life, extreme accuracy, fine finishes and real economy, try Super Carbide-Tipped Tools. You, too, will say they're "SUPER!"

In addition to manufacturing all types of special carbide-tipped tools, Super Tool Company makes a complete line of standard carbide-tipped bits, reamers, plain and side mills, shell end mills, face mills, end mills, counterbores, drills and centers.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

"LOW REJECTION RATE, thanks to MICRO-CHEK"

says F. A. SMITH Manufacturing Co., Inc.

Priced from $9.75 up

Priced from $9.75 up

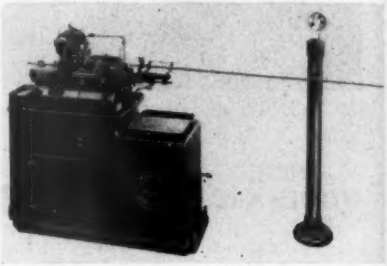
● "Our Trico Micro-Cheks hold close tolerances on parts turned on lathes—especially where machine is of light construction and the operator may apply so much pressure against the lathe stops that the piece is turned too small," says the F. A. Smith Manufacturing Company, Inc., of Rochester, N. Y. "In these situations, the Micro-Chek is a visual aid to the stop. The results are quick, positive operations and a low rejection rate . . . Very useful where inexperienced operators must be employed . . . sturdy, easy-to-read . . . register accurately."

Speed inspections in YOUR plant with TRICO MICRO-CHEK Comparator Gages, now in use in more than 3600 war plants—on machines, on inspection lines. Send for booklet which illustrates many applications.

TRICO MICRO-CHEK
TRICO PRODUCTS CORP.
45 Trico Square, Buffalo 3, N. Y.

Automatic Screw Machine

The Gibbs Model 375 Automatic Screw Machine for turning small parts from bar stock (bar capacity ⅜", turning length 2½") is a product of the Thomas B. Gibbs & Co., Div. of The George W. Borg Corporation, Dept. T, Delavan, Wis. Equipped, as are all Gibbs machines, with five cutting tool holders, it performs a wide range of diameter, form, pinion turning and knurling operations, all of which can be performed in one production cycle. A full range of attachments provide facilities for drilling, counterboring, reaming, threading and slotting operations.



The five single point cutting tools are controlled by flat cams equipped with both lateral and vertical micrometer adjustments, giving complete control in turning various diameters, shoulders, radii and angles. The sliding headstock principle is synchronized with the five cutting tools. Design, workmanship and materials are highest quality as reflected in extreme dependability of the machine under all normal shop demands and uses. High finish, accuracy and concentricity of the finished parts assure minimum number of rejections.

Booklet A-104 "Gibbs Model 375 Automatic Screw Machine" is available from the manufacturer. A60-N

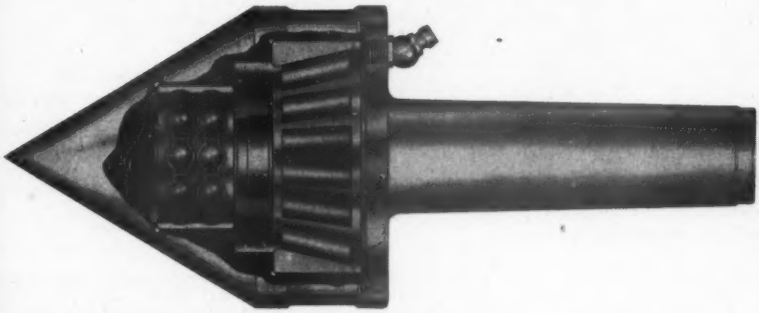
(CONTINUED FROM PAGE 160)

mounted in series with the oil filter. This valve seat grinder is typical of the engineering achievements which contribute to the high efficiency of the company's diesel engines. Since the fuel injection system is the heart of the diesel performance equipment which improves the dependability and accuracy of injection improves the overall efficiency. 85-N

MARVECO

DON'T READ THIS ADVERTISEMENT IF

You still use carbon drills, taps, reamers and tool bits. The Marveco was designed to fill the need for a live center made necessary by our modern cutting tools with their heavy cuts and high speeds. Marveco exceeds your expectations in not only handling these speeds and cuts but also giving you precision and long life.



The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

. . . Let us prove it! . . .

SEND US YOUR CENTER PROBLEMS

MARVEL TOOL & MACHINE COMPANY

Exclusive Manufacturers of MARVECO...The Live Center

10973 W. JEFFERSON, RIVER ROUGE 18, MICHIGAN

(CONT. FROM PAGE 130)

Available Screw Machine Facilities

Due to the many requests for assistance in locating available machine capacity, the National Screw Machine Products Association has set up a clearing house for such requests. All member companies are now reporting to the Association machine capacity currently available and capacity that is expected to be available in the near future. Additional information furnished by these companies enables the Association to promptly locate the manufacturers best equipped to produce a particular part.

This service is provided free to buyers of screw machine products. - Names of suppliers having suitable available capacity may be obtained by furnishing the Association with a description of the required part, including type of material, tolerances, and quantity required.

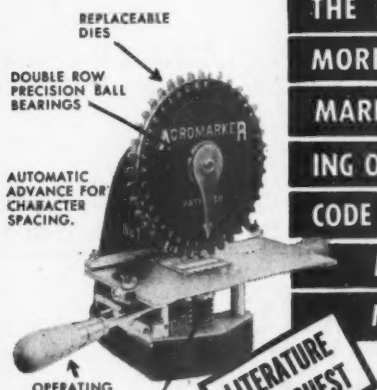
Inquiries should be addressed to Dept. K, National Screw Machine Products Association, 13210 Shaker Square, Cleveland 20, Ohio.

Rehabilitation Fellowship

Plans for conferring upon a research engineer a fellowship providing for an immediate survey and report on current industrial rehabilitation procedure to aid American industries in restoring to paying jobs men wounded in the war or disabled while at work have been approved by the American Museum of Safety at New York University's Center for Safety Education. The plans call for conferring the fellowship upon a research engineer who will survey rehabilitation methods currently employed in at least 20 industrial plants and will file a 100-page report by October.

World War II Veterans Train for War II Production Jobs

A total of 2,935 veterans of this war were taking vocational war production training courses through the period from January 1 to April 1, the War Manpower Commission has reported. Most of them were reported in training in radio, machine operation, welding and aircraft occupations. These veterans


REPLACEABLE DIES
DOUBLE ROW PRECISION BALL BEARINGS
AUTOMATIC ADVANCE FOR CHARACTER SPACING.
OPERATING LEVER.
TABLE LIFTS UP TO DIES, 3/32" LIFT. TABLE ALSO MOVES LEFT OR RIGHT, ALSO IN AND OUT FOR LINE SPACING.
ACROMARKER

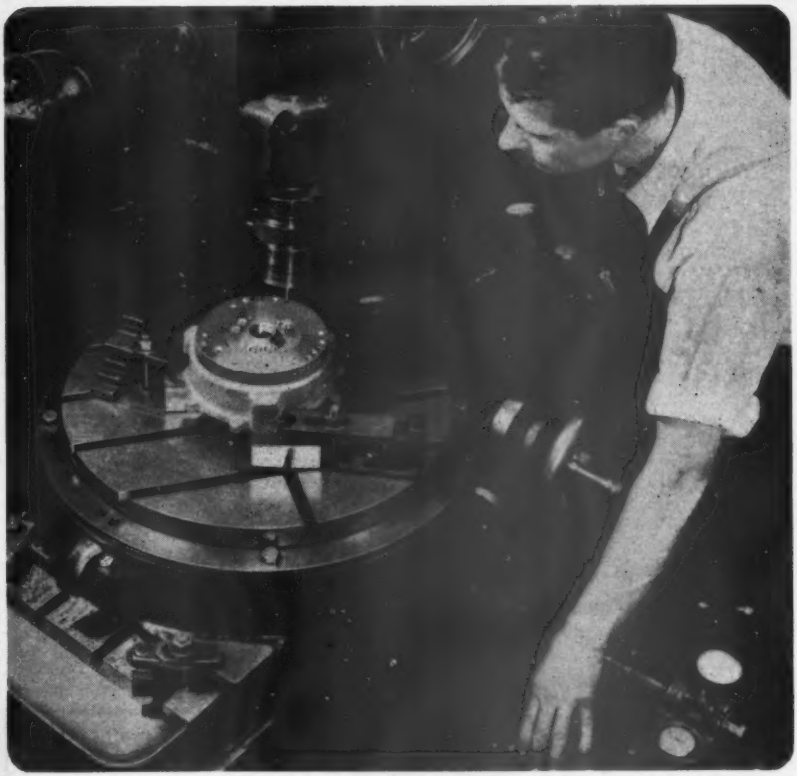
THE ACROMARKER FOR FASTER MORE EFFICIENT AND PERMANENT MARKING, NUMBERING AND STAMPING OF NAME PLATES, OR FILLING IN CODE LETTERS OR KEY SYMBOLS ON METAL, PLASTICS, FIBRE OR MISCELLANEOUS MATERIALS.

LITERATURE ON REQUEST

ACROMARK

MARKING AND STAMPING SPECIALISTS

5-15 Morrell Street, Elizabeth, New Jersey



JIG BORING

Good jig boring work takes equipment, men and time. Even good shops, properly equipped with efficient operators, can't always offer all three since the urgent war jobs that use up jig boring time usually cannot be anticipated.

We at Star, like many other old, well established contract shops, have become very conscious of the emergency work habit of tracking down jig boring hours. Right now we have a limited number of open hours.

Write, phone or wire us.

Designers and Builders

OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT

STAR
MACHINE & TOOL COMPANY

9320 Woodland Ave • Cleveland 4, Ohio

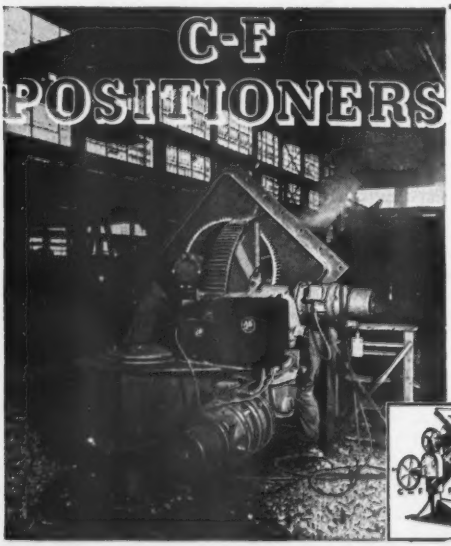
constitute the first large "class" of veterans of this war to enter training after their war service, WMC said. In a majority of the states, the training programs were coordinated by WMC's Bureau of Training and administered by the U. S. Office of Education, of the Federal Security Agency, in cooperation with state and local boards of education. Of the 2,935 veterans enrolled, 2,332 were employed in war production jobs and were in training "supplementary" to their employment. The remainder were in "pre-employment" training preparing for war jobs.

California has the largest number of veterans in training in connection with employment in war industries, with a total of 660 for the three months; Alabama had the next largest total, 283; New York was third, with 275; Texas was fourth with 184; and Michigan was fifth with 179. Other leading states were: Minnesota, 162; Tennessee, 131; Illinois, 127; Ohio, 115; Pennsylvania, 101; Wisconsin, 72; Missouri, 59; Washington, 58; Colorado, 45; Massachusetts, 38; Oklahoma, 38; Indiana, 37; Maryland, 24; New Jersey, 22; North Carolina, 21; Kentucky, 21.

Women Engineers Complete Westinghouse Training Program

Thirty-three women have completed a special nine-month engineering training program at Carnegie Institute of Technology in time to fill an urgent need for skilled assistants in war industry. Graduates of the college course, sponsored by the Westinghouse Electric and Manufacturing Company, are being placed in engineering and research laboratories of the company's plants in East Pittsburgh, Sharon, Pa., and other eastern cities, according to H. C. Madsen, manager of technical employment and training. The girls, ranging in ages from 18 to 29, will act as engineering assistants and will take part in the design of electrical equipment, research work, analysis and testing of electrical and mechanical apparatus, the writing of specifications and compilation of engineering reports.

Selected from 275 candidates, they have been studying since last August when they were chosen for the "scholarships" on the basis of general mental ability, aptitude and interest in engineering, and personal qualities. The new engineers all agreed that the intensive nine-month course they had just completed at Carnegie Tech was "no



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C-F Positioners permit more welding in the same time, more safely, save crane and sling crew time, save floor space. It's stronger, better welding, too—uniformly stronger joints and smoother, neater fillets and beads which eliminate excessive grinding.

Permit you to make downhand welds on all sides, surfaces and angles with a single setup; to use large rods that require fewer passes. Table revolves 360°, tilts to 135° beyond horizontal—adjustable for height. C-F Positioners are provided in capacities to 30,000 lbs., hand or pushbutton control operation. Table rotation from 0 R.P.M. up. Pedestal or boom mounted to give maximum floor and working clearance.

Write for Bulletin WP-22

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THIS NEW *Free* 40-PAGE BOOK SHOWS HOW

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Sub-zero treatment of metals is being employed in more industrial applications every day. Men who aren't already using this effective process have read about the excellent results it is producing in many fields. Everyone wants last-minute information and discoveries about cold treatment—its effect on metals, fields where it is practical, procedures for treating different metals, etc.

To bring you the latest authentic cold treating practices and data, Deepfreeze has just completed a 40-page booklet that is filled with valuable information for every man working with metals.

This new FREE book explains what actually occurs when metal is subjected to chilling, and how the changes that take place are adaptable to a wide range of industrial applications.

You'll find the complete story on hardening, stabilization, shrinking and testing of metals and other materials. Three distinct methods of cold treating procedure are described in detail for use in different types of applications. Metallurgists, production men and other Deepfreeze users have contributed the results of their experiences—results that show how you can obtain the advantages of cold treating in your plant.

Cold treating is on the move. Progress has been made so rapidly that yesterday's literature no longer tells the complete story. To bring your organization up-to-date on this vitally important subject, order free copies of "Cold Treating Practice" for your key men.

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snap", but Dr. B. Richard Teare, acting George Westinghouse professor at Carnegie Tech, has this to say about the women engineers: "These young women not only showed a keen interest in their work from the classroom to the shop laboratory, but they also showed intelligence in the preparation of their studies and an aptitude for the subjects that would have kept many men students on the go to keep up with them".

Typical placements include assignments to the research lab at East Pittsburgh where the new engineers will work on nuclear physics, high frequency studies, the mass spectrometer and X-Ray projects; the transformer division at Sharon, Pa., where they will work on generator coil designs; other assignments were made to the Rectox lab of the motor division; the electrical appliance division at East Springfield; the engineering lab at Cleveland; the radio division at Baltimore; and the lamp division at Bloomfield.

Navy Releases Four Timely Films

Recent motion picture shorts, produced by the Industrial Incentive Division, U. S. Navy, now available for showings to war plants are: Behind Nazi Guns (20 minutes; 16 or 35 mm) —the inside story of Germany's industrial war power today. Through captured enemy film and footage, the picture reveals working conditions in much-bombed Germany and dramatically points up to the American worker the challenge that has been flung at him by his "opposite number" on the Nazi workbench. It is narrated by William L. Shirer, noted journalist and author of "Berlin Diary". The Battle Against Shop 13 (15 minutes; 16 or 35 mm)—Steve Karras, a typical American boy, leaves his war job to become a Navy aerial gunner. An exciting, unexpected climax drives home poignantly a reason why the men at the fighting fronts will be given all-out production backing. Your Ship In Action (10 minutes; 16 mm only; in color)—The saga of a fighting ship from the time of its launching to its first baptism of fire in the Pacific. Photographed in Kodachrome, this pic-

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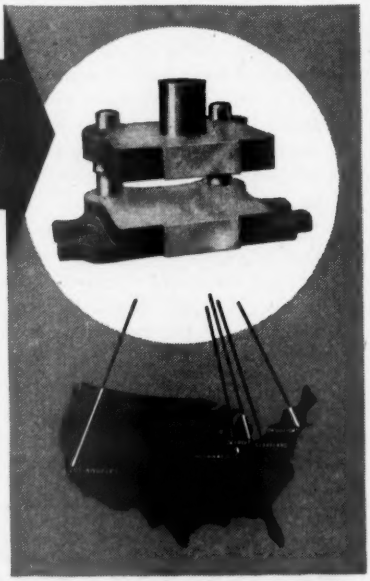

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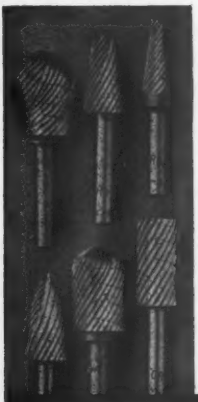
ture brings to American Production shipmates an exciting, first-hand account of a great ship of war. The Industrial Incentive Division announced that these films are most timely in view of current operations against the enemy, and contain much up-to-the-minute combat footage. Plants desiring to show these films should write to: Chief of Industrial Incentive Division, Navy Department, 2118 Massachusetts Avenue, N. W., Washington, D. C.

Wider Use of Magnesium Alloys in Plane Building

Magnesium alloys are being used in increasing amounts in aircraft construction, as new applications successfully pass service tests.

Recent use of certain magnesium alloys in production changes in the Douglas C-47 airplane have proved entirely satisfactory, according to L. D. Mosely of The Douglas Aircraft Company, who recently told a Detroit meeting of the S.A.E. these facts: "The floor and sub-floor structure of the C-47 airplane is entirely different from and much heavier than that of the DC-3 airplane. Since the wing structure passes through the fuselage, those floor beams located directly above the wings are not as deep as those used elsewhere in the fuselage. The smallest beam in the area above the wing is 1⅛" in depth; the largest beam in the fuselage is 10" in depth. Some of these floor beams are extrusions and some are built-up Wagner type aluminum alloy beams. Two sizes of beams, the 2⅝" and the 6" are now magnesium alloy extrusions. There are also a few aluminum alloy extruded floor beams. The largest beams are located where the heavier cargo items are tied down to the floor. Although the extruding requirements made the webs of the 6" magnesium alloy beams heavier than they had to be for structural requirements (their thickness is .093"), the magnesium beams are still 5% lighter and about 25% stronger than the built-up aluminum alloy beams. The material used is the Dowmetal C-1 alloy. Cost of the built-up aluminum alloy beams is half as much as that of the corresponding magnesium alloy extruded beams.

"Service records for all three types of beams have been entirely satisfactory. After the airplane had been in service about a year it was found necessary to reinforce one of the built-up aluminum alloy beams, otherwise there has been no indication of inadequate strength in the floor beams."



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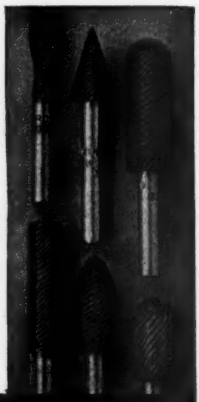
Send for catalog YR, the most complete of its kind illustrating and describing GROBET Rotary Files, Diesinkers, Burs, Tube Burring Cutters, Chatterless Countersink, etc.



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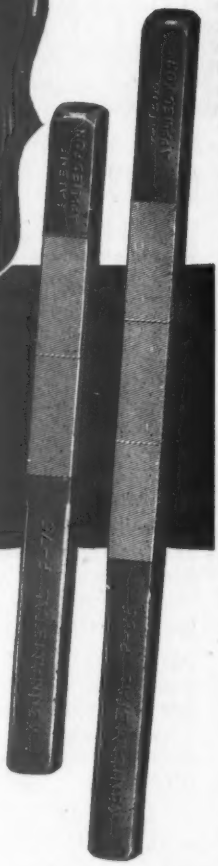

KENNAMETAL *Lathe File Does as Much Work as 150 Mill Cut Files*

...AND PRODUCES A BETTER FINISH!

Comparative service tests continue to prove convincingly that Kennametal lathe files multiply production, improve quality of work, and effect substantial savings in the cost of files used. For example, on the job illustrated above:

A mill cut steel file, employed to remove the sharp edges from the 400 Brinell steel part, wore out on about 100 pieces. A Kennametal file turned out 800 pieces the first day—stayed on the job two weeks—and produced 15,000 pieces. The Kennametal file cut a curling chip—did not scrape or skid—and provided a finish that was almost as smooth as a grinding job!

Kennametal lathe files outlast steel files 50 to 200 times, because their surface is made of the same hard, cemented carbide composition as steel-cutting Kennametal-tipped tools. They permit filing speeds 3 to 10 times those possible with steel files—doing an outstanding job on cast iron and brass at surface speeds around 900 feet per minute, and on high-carbon, high-chromium steels at 800 surface feet per minute. The keen, sturdy teeth of a Kennametal file will make a clean, true cut on steels up to 62 Rockwell C, a hardness that ordinary files cannot touch.

The value of any tool is measured by the quality and quantity of work it produces. The higher original cost of Kennametal lathe files is insignificant compared to the tremendous economies effected through their use. Order one today for test purposes—let it prove its merit in your shop.

Kennametal Lathe Files are now furnished in two sizes—11" or 14" long—and each size is available with either 20 or 30 teeth per inch. The 11" size (F-76, 30 teeth/inch; F-77, 20 teeth/inch) having a filing surface 4" long x ¾" wide, costs $12.50. The 14" size (F-86, 30 teeth/inch; F-87, 20 teeth/inch) having a filing surface 6" long x ¾" wide, costs $18.50. All sizes can be shipped promptly.

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SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc.

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FROM STOCK
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HIGH SPEED—PRECISION
CENTER
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No longer is it necessary for you to cut down one of your drills for centering purposes. These tools are designed to give long and dependable performance.

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Satisfaction assured on a complete stock of all types of standard cutting tools and end mills.

Prompt Delivery on Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements

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Write for prices on standard sizes or submit blueprints for special sizes

Galter Manufacturing Co.
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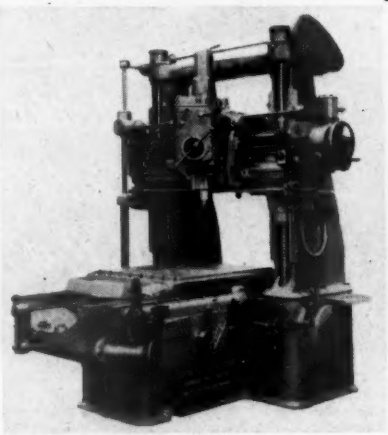
Hydroptic-B Jig Borer

The Hydroptic-B Jig Borer, a hydraulic feed, optical setting unit in the "sip" line (Societe Genevoise D' Instruments de Physique, of Geneva, Switzerland), developed to perform milling as well as boring operations with an equal degree of precision, is announced by the Cosa Corporation, Dept. TD, 5000-4 Chrysler Bldg., New York, N. Y., exclusive representatives in the United States for this equipment.



The Hydroptic-B meets the demands for higher and permanent accuracy. The machine is equipped with an optical measuring system consisting of a standard scale of extreme precision and sighted by a micrometer microscope—the ideal method of setting since it is not affected by mechanical stresses. The guaranteed accuracy of all settings of the work table and spindle is .0002".

The hydraulic table drive provides large and instantaneous feed variations. It permits rapid traverse of the table over its full stroke in half a minute or the stepless reduction of its speed down to an extremely low rate, according to the position of the controlling lever. The table is so sensitive that after a few minutes training an inexperienced operator is able to stop the table with an accuracy of a few thousandths of an inch.

(TO PAGE 180—PLEASE)

CRITERION Diamond TOOLS

Accelerating WAR PRODUCTION

Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.

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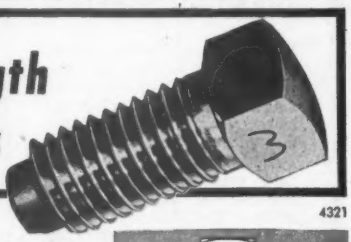
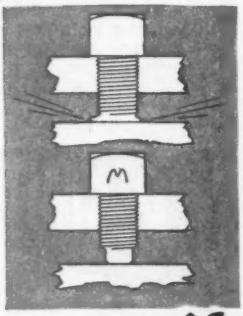


4321

When three screws can do the work of four, five or more, they save drilling, tapping and assembling time and labor. They speed production and cut costs.

Mac-it Cap Screws are heat-treated for maximum strength and toughness. This extra strength can be used to provide ample holding power with fewer screws.

The Mac-it "m" on the head is your guarantee of quality. It appears on all diameters ¼" to ¾", inclusive.



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Square Head Set Screws

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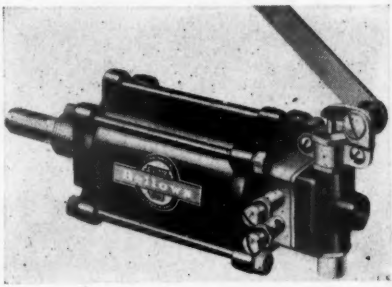
DIAMOND WHEELS
Resinoid-bonded for grinding of carbide-tipped tools in large quantities. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.
Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.
Catalog on request.
J. K. SMIT & SONS

Improved Air Motor

A new air motor, Model BM, an improved version of the Bellows-Senacon Air Motor and designed to make automatic many operations formerly done by hand, is announced by The Bellows Company, Dept. TD., Akron, Ohio.

The Model BM departs radically from conventional air cylinder design. It is a complete self-contained power unit, with integral valve, operating lever and



speed controls, giving the operator full and positive control over all phases of its operations at all times. The valve operating lever is adjustable to any angle in any plane and is easily synchronized by simple linkage, cam or solenoid controls, to the machine cycle for fully automatic operation.

The air motors are easily incorporated into production processes to perform a wide range of work. It replaces such hand operations as feeding work to tools, tools to work, opening and closing vises and holding fixtures, operating clutches and latches and is used as a source of flexible power for various staking, clamping and embossing operations. A survey indicated that the use of the Air Motor increased production from 50 to 500% and substantially reduced operator fatigue.

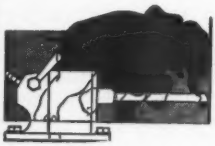
The Model BM operates on any air pressure up to 175 psi. It is available in strokes ranging from 1½" up to 48". Nose and foot mounts are standard equipment with front sheef and pivot mountings also available. 839-N

A second star has been added to the Army-Navy E pennant recently awarded Haines Gauge Co., Philadelphia.

Announcing

MEAD MIDGET AIR CLAMPS

Horizontal and Vertical!



Both models deliver 80 lbs. pressure on a line pressure of 100 lbs. They'll save countless man-hours in assembly operations involving welding, riveting, bolting, etc. *Advantages over mechanical clamps:* 1. Any number can be operated by single master valve. 2. Easily installed in cramped corners. 3. Equal ram pressure at any stroke point. Send for new Mead AIR POWER Catalog, describing our line of Air Clamps, Air Vises, Air Presses, Work Feeders, Valves, Controls, etc.

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With Less Tap Breakage

Special design, improved dry-clutch and precision workmanship make Procunier Tapping Machines *so sensitive* that even unskilled operators can detect an overloaded or dull tap—or determine instantly when tap hits bottom of hole. That means greatly decreased tap breakage. Other features of Procunier design that assure faster, more accuate tapping are: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF THE OPERATOR; Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate; One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.

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giving full details and prices on the full line of Procunier Universal Tapping Machines, Procunier Precision Tapping Heads and the new Tru-Grip Tap Holder.

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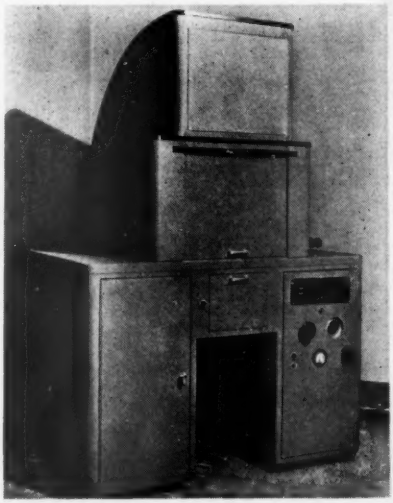
Searchray Model 150

The new Norelco Searchray Model 150, a complete self-contained industrial X-ray unit for non-destructive internal examination of metal, plastics, hard rubber, small electrical parts, tubes and many other parts is announced by North American Philips Co., Inc., Dept. T, 100 East 42nd St., New York 17, N. Y. A versatile inspection tool, the Searchray 150 is rayproof and shockproof. The housing encloses the oil immersed, water-cooled tube which is protected from overheating by an automatic switch. Parts to be inspected are placed in the convenient, bench-height, lead-lined specimen compartment and positioned by use of the fluoroscopic viewing device. A special cassette tunnel is provided for use in taking the radiograph. Then the proper kilvoltage is selected (stepless, 20 to 150 kwp) from the direct reading scale (on right, selector has 3 direct reading penetration scales), the film is inserted, the timer set (1-20 minutes at 10 second intervals), and the exposure made.

Searchray 150 gives sharp definition of defects of parts or pieces within the limits of the machine. One minute exposures give maximum penetrations of 4 inches of aluminum, ¾ inch of steel or cast iron and ½ inch of copper or brass.

(TO PAGE 178—PLEASE)



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(CONTINUED FROM PAGE 176)
Greater thickness can be radiographed by using intensifying screens and increasing exposure time. Scales are calibrated for thickness and type of material.

The unit can be operated successfully after a short period of instruction. A circular giving full data is available from the company. B1-N

Universal Floating Chucks drill, counter-bore, ream or pilot from a lead hole. Adjustable pressure compensates for tool weight, allows increased feed without causing marred holes. For horizontal operation in screw machines and turret lathes. Write today for further facts about Universal Floating Chucks, Collet Chucks, MIKRO-LOK Boring Bars and Drill Bushings.

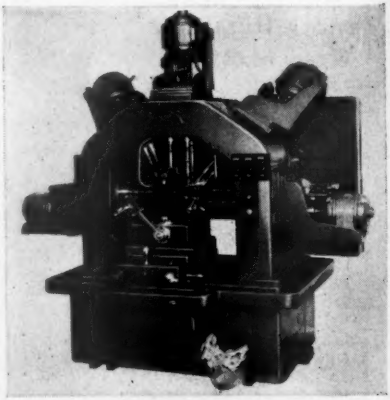
UNIVERSAL ENGINEERING
FRANKENMUTH,
MICHIGAN

Multiple Direction Tapping

This special-purpose machine, designed and built by Snyder Tool and Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan, is made with varying numbers of tapping units and various combinations of single and multiple spindle heads.

With the ball-bearing mounted fixture table in the forward loading position, the work part is located by plungers entering rockershaft holes and is clamped by means of a cam-action lever. While fixture and table are in this loading position the safety limit switch cannot be closed and therefore, the machine cannot be cycled. The entire fixture and its slide are then rolled into working position, located accurately by an index pin entering the table, and locked in place. This action closes the safety limit switch and permits the tapping units to be sent through a working cycle.

The tapping units are developed for individual lead screw tapping and consists of two parts—the motor mounting bracket and the first reduction gear unit, including limit switches and controls. Machine base and column are welded steel. For set-up purposes, each head has an individual push button which operates that single head forward as long as the operator presses the button. When forward position is reached, the limit switch stops forward motion and the operator must press the return button until the spindles are fully retracted. 466-N



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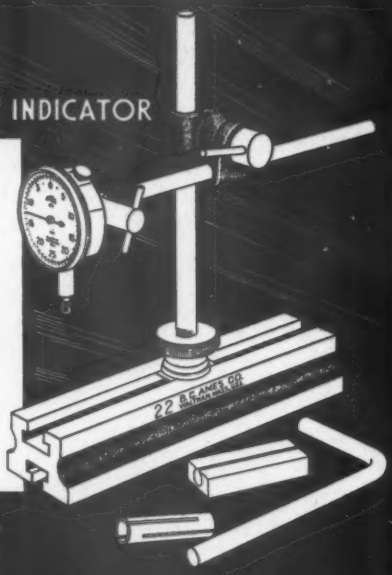

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205 ADAIR STREET **DETROIT, MICHIGAN**

(CONTINUED FROM PAGE 176)
Greater thickness can be radiographed by using intensifying screens and increasing exposure time. Scales are calibrated for thickness and type of material.

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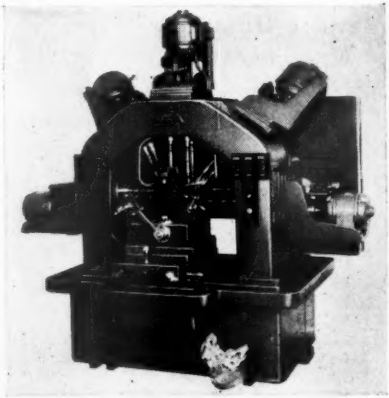
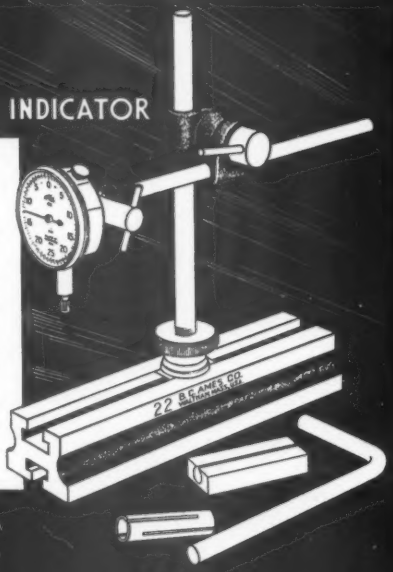
This special-purpose machine, designed and built by Snyder Tool and Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan, is made with varying numbers of tapping units and various combinations of single and multiple spindle heads.

With the ball-bearing mounted fixture table in the forward loading position, the work part is located by plungers entering rockershaft holes and is clamped by means of a cam-action lever. While fixture and table are in this loading position the safety limit switch cannot be closed and therefore, the machine cannot be cycled. The entire fixture and its slide are then rolled into working position, located accurately by an index pin entering the table, and locked in place. This action closes the safety limit switch and permits the tapping units to be sent through a working cycle.

The tapping units are developed for individual lead screw tapping and consists of two parts—the motor mounting bracket and the first reduction gear unit, including limit switches and controls. Machine base and column are welded steel. For set-up purposes, each head has an individual push button which operates that single head forward as long as the operator presses the button. When forward position is reached, the limit switch stops forward motion and the operator must press the return button until the spindles are fully retracted. 466-N



AMES No. 22. DIAL TEST INDICATOR



An ideal testing outfit for machinists, tool-makers, inspectors, scrapers and assemblers. Handy for determining the flatness of surfaces, roundness and trueness of revolving parts, relative heights and thicknesses, etc. Adjustable to any position, nicely proportioned for easy handling, sturdily built to support the Indicator rigidly, and nicely finished.

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Unit Drives

The Unit Drive, a flexible shaft drive that can be used on any electric motor, is a product of Elliott Manufacturing Company, Dept. TD, 512 Prospect Ave., Binghamton, N. Y. Since the Unit

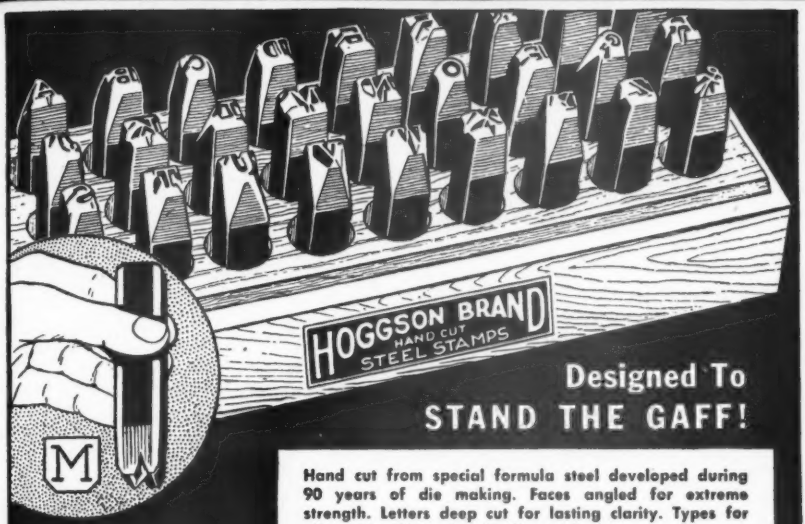
Drive may be attached instantly to standard motor shafts, an extra flexible shaft machine is made available or utilized as a replacement should other flexible shaft machines break down.

Extra Unit Drives make possible additional polishing, grinding, cutting or finishing facilities up to the number of motors available. Unit Drives will operate with any of many attachments available to make them useful for many operations. For additional information address the company. **283-N**

(CONTINUED FROM PAGE 172)

Since the milling and boring operations can be performed at one set-up much of the detailed and laborious layout can be eliminated with the Hydroptic-B Jig Borer. In addition to jig and fixture work, the unit can be used for the direct machining of component parts.

Reports indicated that the Hydroptic-B is being used in a number of manufacturing plants throughout the country on production work. A complete range of high precision accessories is available and additional equipment including precision circular dividing and tilting rotary tables can be furnished. A detailed catalog is available. **250-N**



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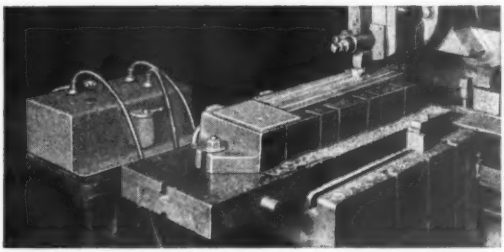

"We feel the above have been in use long enough, over a representative number of sizes of gibs, to report a saving in floor to floor time on machining of an average of 37% over our old fixtures."
E. E. Hallberg, Rockford Machine Tool Co.

"We cut the milling time on gibs from 3.2 hours to 1.3 hours."
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"We take this opportunity to tell you that this is one of the finest and most useful tools that we have in our plant."
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Many installations, not to be disclosed until the war is won. Engineers tell us that they plan to use these chucks for greater savings in post war reconversion.

Prompt delivery on special chucks to meet your problems.

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Chucks and control units in stock. *Send for illustrated catalog.*

TIME YOU DISCOVER STRENES METAL

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Builders of automobiles, trucks, tractors, farm implements; refrigerator, stove, metal furniture manufacturers; designers of fans, blowers, bicycles; almost anything involving drawing and forming operations.

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That is just part of the Strenes story. Why not get the rest of it? Isn't it high time you also "discover" Strenes Metal for drawing and forming dies?

THE ADVANCE FOUNDRY CO.,

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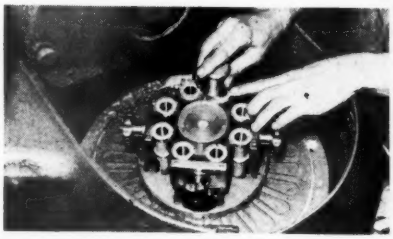
DoAll Instrument Set

Continental Machines offer a line of gage instruments which, with gage blocks, will perform practically all precision measurements. With block holders and caliper bars, snap gages and a precision height gage can be made up, accurate to millionths of an inch. Trammel points and center points for checking layouts, scribing, checking center distances or thread lead, are included. Flatness of finished work is determined by the two quartz optical flats and a high intensity monochromatic light. The 5" sine bar is for angle measurement to accuracies of 00° 00′ 04". An adjustable vernier gage enables gage block combinations to be made in increments of .00001".

Detailed information can be obtained from Continental Machines, Inc., 1303 Washington Ave. South, Minneapolis 4, Minn. 696-N



Tappet guide heads, formerly ground one at a time, are now ground in sets of eight on an unusual new fixture developed in the tool room of the Republic Aircraft Products Division of The Aviation Corporation. The new fixture, shown positioned on a rotary grinder magnetic table, is octagonal in shape and clamps the tappet guides in pairs by hand screws.

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We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

Directory of Commercial Laboratories

As a result of the efforts of several of the leading laboratories in this country to awaken greater recognition by the public of the important work of independent commercial laboratories, and to acquaint industry with the competency of their services, the American Council of Commercial Laboratories was organized in 1937. The movement stemmed from the desire of the executives of these laboratory enterprises with substantial capital investments, who were interested in preserving independence of action and believed in the private enterprise system, to establish an association devoted to the maintenance of commercial laboratory services on a high plane of integrity, which could take its place among American trade associations.

The plan of this Directory is designed to afford a convenient and comprehensive Reference Manual of Independent Testing, Research and Inspection Laboratories. It contains: A general statement of the broad functions of independent laboratories serving industrial America; a brief history of the organization of the American Council of Commercial Laboratories; excerpts from the By-Laws deemed to be of public interest relating to the eligibility of laboratories for membership; the standards maintained by the laboratories in serving the public; and the relationship between the laboratories and their clients.

The pages of the following section each contain a statement presented by the individual member laboratories, describing their own organization, executive officers, personnel, and a recital of their customary services and particular specialties.

The Directory concludes with a chart arranged to present a rapid and graphic survey of the activities of all the member laboratories. It contains a tabulation of Testing, Research and Inspection Services rendered in connection with specific categories of commodities, materials or projects grouped under several major classifications such as Textiles, Machinery, Construction, Vegetable Products, and the like.

Inquiries may be addressed to the Laboratories or to the Executive Secretary, 63 Wall Street, New York 5, N. Y.

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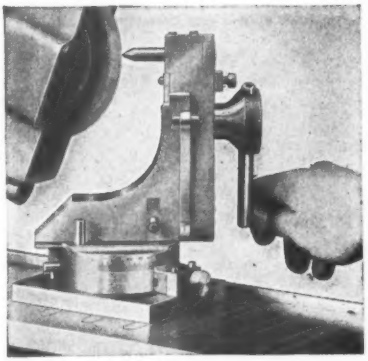
The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.



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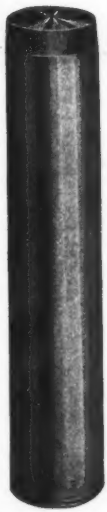

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Seven short arm keys are included in this strong leatherette envelope. They fit Nos. 8, 10, 1/4", 5/16", 3/8" 7/16" and 1/2" set screws, and Nos. 4, 5, 6, 8, 10, 1/4" and 5/16" cap screws . . . . . LIST PRICE $.50

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KIPP Air Grinder

Illustration Approximately ½ Size

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Every toolmaker, every tool crib, every machine shop and thousands of production jobs need a model H Kipp Air Grinder. Because of expanded facilities the delivery position on high ratings has been measurably improved. Accessories in reasonable quantities can usually be shipped out of stock. Madison - Kipp Air Grinders were developed by practicing tool makers so they are practical. They usually pay for themselves on a single job.

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Sheffield Air-Flow Snap Gage

The introduction of a new type of snap gage spindle, combining the features of snap and air-flow gages, for use with their Precisionaire is announced by the Sheffield Corporation, Dayton, Ohio.

A distinctive advantage of this spindle is that it can be used on highly finished or soft plated parts without marring or scratching. It can also be used on thin-walled cylinders without any danger of distortion. Two other uses are for checking work while in the machine and for checking parts of large size or unwieldy shape which could not be presented to the gage. The illustration shows the "C" type snap being used to check a shaft. By using the Precisionaire, the dimensional quality can be checked to a fraction of a "tenth" (.0001"). The shaft was formerly checked with a solid snap gage having an average life of only one hour, and twenty-four of such gages were required each day. The savings effected by the Precisionaire Snap Spindle applications are resulting in their use being rapidly expanded. Descriptive, illustrated literature and detailed specifications may be had by addressing The Sheffield Corporation, Dayton 1, Ohio. 24-N

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Capacity 7/16" hole through 1/4" steel or 3/8" hole through 5/16" steel.
All Parts Interchangeable - - - - - - - - - Weight 70 lbs.
Punches and dies carried in New York stock from 1/16" to 1/2" by 64ths. Also some drill numbered and commonly used square, flat and oval sizes.

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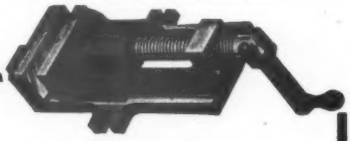

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
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If none of the stock sprockets meet your specifications, you can get CULLMAN Sprockets MADE TO ORDER promptly and economically. CULLMAN specialized equipment and experience are your assurance of this.

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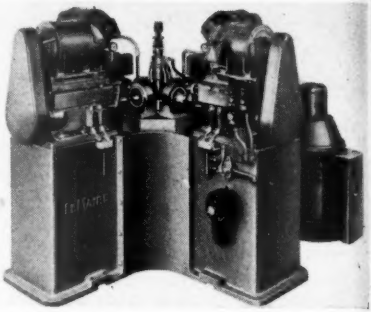
New Four-Way Universal Machine

Four standard end bases each supporting a LeMaire Twin Ram Hydraulic Unit bolted to a special center base forms the new LeMaire Four-way Universal Machine developed by LeMaire Tool & Mfg. Company, 2631 S. Telegraph Road, Dearborn, Mich., for hollow milling and facing universal joint spiders.



The work piece is laid on the center fixture and locked in place by air clamps. The four spindles operating at stations 90° apart machine the outside diameter and face shoulders of the four trunnions of the spider. Each spindle has a sleeve supported in brackets, rides on precision ball bearings, the sleeve is held stationary while the spindle revolves inside of it. This eliminates any galling or possible chip trouble.

One control button actuates all spindles—they rapid advance, feed, dwell and rapid return simultaneously and automatically. As the operation also finishes the shoulder at the end of the cut, the tool momentarily dwells at that point to produce a smooth surface on the shoulder face. Production is approximately 150 pieces per hour at 100 percent efficiency for a trunnion with ⅝" diameter, ⅝" in length.

The same type machine can be arranged for boring, drilling, reaming and other operations. In many cases threading operations can be done in the same setup. It is also possible to perform different operations at each spindle by the use of a hand or automatic index table. **363-N**

The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

USE THE H-M
SAVE ON
SMALL DRILLS

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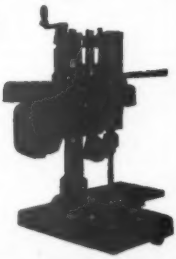
Quicker—Cheaper

For holes from .004 to .250" diameter . . this drill gives you precise, clean holes . . drilled quicker at lower cost per job.



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We also make numbering machines, automatic or non-automatic for stamping numbers and letters into metal

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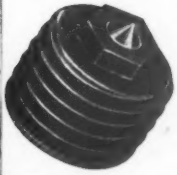

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters.

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Universal Mikro-lok Boring Bars are designed for finishing cuts where extreme accuracy is required. For jig boring, diamond boring and screw machines. Especially adapted for boring to a shoulder, or to the bottom of a hole or where intermittent cuts are being taken. Extremely rigid. Easily and quickly adjusted like a micrometer to limits of .0005 or less. Available singly or in sets. Write for facts and prices.
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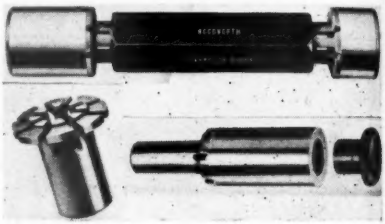
Segmented Shank Plug Gages

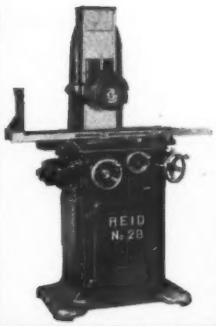
A new type Carboloy plug gage with an exclusive segmented shank which is lighter in weight, better balanced and which, it is claimed, assures less operator fatigue and more accurate inspection has been introduced to industry by N. A. Woodworth Company, Dept. T, 1300 East Nine Mile Road, Detroit 20, Mich.



The Woodworth Carboloy gage with segmented shank avoids the constant hazard of the permanent bonding of cemented carbide bushings to steel shanks because the design compensates for the difference in the coefficient of expansion between cemented carbides and steel, permitting a trouble-free bond. The segments separated by slots, permit "breathing" and allow for expansion or contraction resulting from temperative changes.

A Guide-Guard cap of shock-proof material provides for unusual protection to the Carboloy bushing-type gaging member and series as a pilot to quickly locate the gage in the work. The cap, which is easily removed, permits the gages to be used for blind holes. The hollow bushing plus the slots in the shank form an air vent.

Carboloy plug gages range in size from above .510 to 1.510 inches; the cylindrical plug gages in standard sizes from .059 to 1.510 inches. Other Carboloy gages now produced by the Woodworth Company are master discs, concentricity gages, paddle gages and many other types of special gages requiring the use of highly wear-resistant materials. Carboloy, used as a gage material, has been found to outwear steel many times—particularly when gaging high abrasive material. **926-N**



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A Proven Product for] Over a Quarter Century with Thousands in Use Daily. Equipped with Motorized Spindle. Send for Descriptive Literature. EXCELLENT DELIVERIES.

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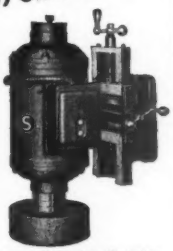
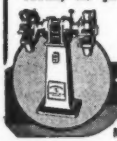
YES SIR! You can now make your machine a "double purpose" machine, the "Standard Way". STANDARD VERTICAL SPINDLE GRINDERS can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc., giving you added profits! Available with or without feeds, as preferred.





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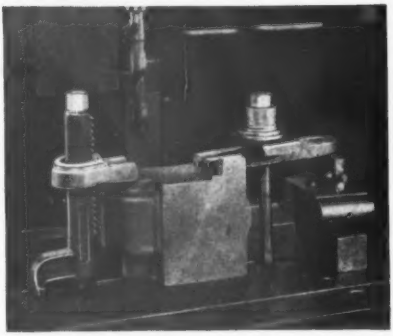

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Clamping methods for holding work to the machine table have been improved. Howell adjustable high speed work clamps are practical in every sense of the word and needed in every machine shop.

Send for descriptive literature describing these unique clamps.

HOWELL CLAMP COMPANY

1373 East 95th St., Cleveland 6, Ohio

MINN-KOTA TAP GRINDING TOOL

With HOLDING Fixture for Bench Grinder

This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.

Fixture adjustable to fit any bench grinder

MINN-KOTA MFG. CO., Dept. 905, FARGO, N. D.

A total of 12,000 tons of copper, enough for more than 1,200,000,000 machine gun cartridges and the equivalent of 1,100,000 miles of telephone wire, was returned to the national stockpile from the plant of the Bell System during 1943.

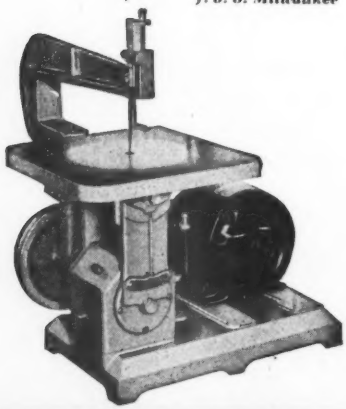
ATLAS DIE FILER

This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.

Complete with motor and saw attachment at

$125.00

f. o. b. Milwaukee

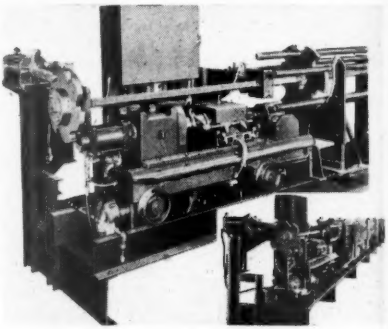


Milwaukee Chaplet and Mfg. Co.

1023 S. 40th St. • MILWAUKEE, WIS.

Automatic Reaming and Burring Profiler

A new combination automatic reaming and burring profiler for handling tubes up to 6" OD and length from 3 feet to 60 feet or longer is announced by Pines Engineering Co., 600 Prairie Ave., Dept. D, Aurora, Ill. This company is a specialist in the manufacture of tube fabricating machinery. Production of 200 to



400 tubes per hour can be obtained on end facing and burring operations and of 100 to 200 tubes per hour where an additional operation of inside reaming is required.

The head assemblies of spindles and chucks are mounted on heavy cars suspended on flanged wheels which are anchored to the channel iron track. One car can be moved to position for processing any length of tube required. An automatic reel feeding mechanism feeds tubes to and from the profiler. This mechanism selects tubes from storage rails regardless of diameter. The indexing mechanism, automatic self-centering type chucks and the spindle advance are all actuated by hydraulics cylinders.

The control panel houses the relays, motor starters and other electrical accessories for automatic cycle operation. The same type profilers is also used for threading, flaring, burring, turning, boring and chamfering pipe and tubing. 426-N

Increase Production with

CURVED TOOTH MILLING CUTTERS

Woodruff Keyway . . . Plain Mills . . . Staggered Tooth Side Mills . . . R & L Hand Shear Side Mills . . . Overlapping Side Mills.

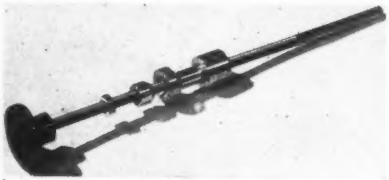
Write for Literature

ABER ENGINEERING WORKS, INC., Waterford, Wis.

INCREASE LATHE PRODUCTION

with the

Decker Spindle Lathe Stop



- Increases output
- Holds close tolerances
- Requires little skill
- Easily & swiftly set-up
- Fits both spindle and collet draw-bar for South Bend, Logan, Atlas, Sheldon, Clausing and Craftsman Lathes

Price **$5.00** a set

For other lathes send "i. d." and length of spindle & collet draw-bar. Stops will be made from our stock supply at a slight increase in price.

DECKER MFG. CO.

756 Willow St. - Chicago 14, Ill. - Mich. 0889

A production tool, smooth in operation, engineered to fill a broad field where a fast bench unit can be used most advantageously. It saves time by taking the part to be machined to the grinder instead of taking the grinder to the part as in the case of a portable tool. It leaves the operator with both hands free with which to handle the work; the result, much more production. 3 stages of power.

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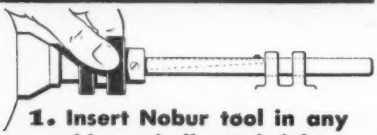
BARTH STAMPING & MACHINE WORKS

BARTH STAMPING & MACHINE WORKS · THE BARTH MANUFACTURING CO.

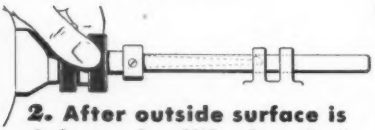
DENISON AND WEST 24TH STREET CLEVELAND, OHIO 1868 COLUMBUS ROAD

How to deburr holes faster!

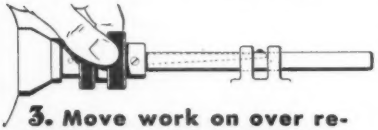


1. Insert Nobur tool in any machine spindle and deburr outside surface of work.

Works like a drill—operator works with complete safety—parts can be burred as fast as they can be handled by operator.



2. After outside surface is deburred, slide knurled sleeve back to retract blade.



3. Move work on over retracted blade and deburr inside surface.

Double-edged cutting blade thus instantly removes burrs around holes in flat or curved surfaces of single or multi-walled parts—smoothly and accurately.

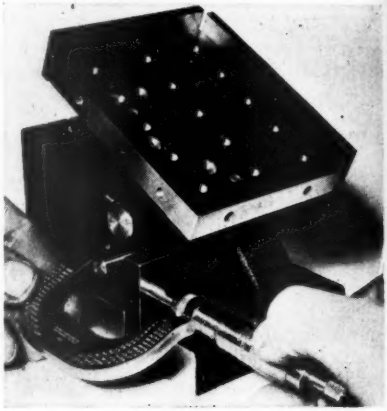
Send for deburring folder. Write

NOTE
All Nobur tools are now furnished with pilot shafts hard chrome plated!

NOBUR MANUFACTURING CO.
912 NO. ORANGE DRIVE
LOS ANGELES 38, CALIFORNIA

Bemisine Precision Set-Up

The Bemisine is a multi-purpose tool room accessory for setting or measuring any angle from 0 to 90° to an accuracy within one minute. This new tool requires only a 2" micrometer and reference to a standard table of sines and cosines to determine and set any angle within its range. The construction consists of a precision ground right-angular base which supports an accurate,



drilled and tapped work holding table measuring 3½" x 4". This work table is mounted pivotally so that it can be tilted to any angle up to 45°. Angles in excess of 45° are secured by repositioning the fixture on the second surface of its right-angular base and computing the complementary angle. Thus, an angle of 30° when the Bemisine is in one position automatically becomes an angle of 60° when the tool is positioned at 90° to its original position. When the work table is at "zero" setting the measurement over pin and block is exactly 1". As the table is tilted, the pin, which is integral with the table assembly, changes its distance from the block proportionately and a reading taken over the pin and block at any point (minus the 1") is the true sine reading of the included angle. Standard gage blocks may also be used with the Bemisine to determine angles. Descriptive literature is available by writing Nichols-Morris Corporation, 50 Church St., New York, N. Y. 943-N

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4 INCH BAR HORIZONTAL BORING, DRILLING & MILLING MACHINE

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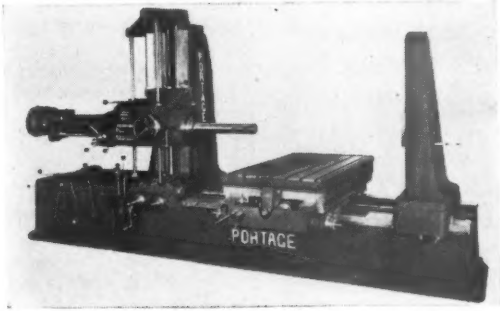

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● Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

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555 Miami Street, Akron 11, Ohio

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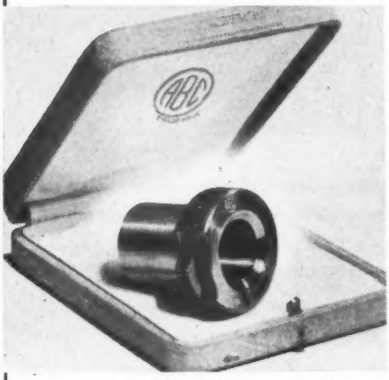

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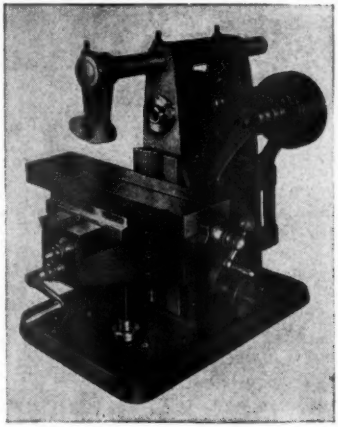
ACCURATE BUSHING COMPANY

447 NORTH AVE., GARWOOD, N. J.

New Bench Miller

A new Bench Miller, model B-12, has been added to the Diamond Milling Machine line by the Diamond Tool Company, 3430 E. Olympic Blvd., Los Angeles 23, Calif. Said to be the largest bench mill now manufactured, the new model provides a low cost, high production machine that can do any job within its capacity as efficiently as a large miller and at a far lower cost.



The model B-12 features a 5⅛" x 20" table with a longitudinal travel of 12", a vertical travel of 9" and a transverse travel of 6". The heat treated spindle is mounted in taper roller bearings and is equipped with a No. 9 B & S taper. The spindle nose is hardened and ground for perfect concentricity and finish. A needle type bearing mounted in the overarm provides friction-free, trouble-proof support for the arbor.

A three step pulley with double "B" vee belts provides power to the spindle. A jackshaft allows rapid belt shifting and tension adjustment. Six spindle speeds range from approximately 100 to 1,400 rpm. A full line of accessories designed for the Diamond B-12 is available. 268-N

"I am sure that this book which is really the only one of its kind, will be helpful to the plastics industry . . ."—comment by an executive in the industry on Gordon B. Thayer's "Plastics Molds". For details see page 216.

Will You Help Us?

The growing interest of our readers in plastics has led us to institute and build up the "Industrial Plastics" section of our magazine. The steady growth of the number of tool room and die shops that have entered or made plans to enter the plastics molding or fabricating field, the number of manufacturing and production plants that are adding plastics working facilities have taxed the usual procedures of our circulation department to keep individuals, departments or companies accurately classified.

As you know, our circulation lists are put together with extreme care and maintained systematically. Our coverage is as thorough and accurate as we can make it by consistent checking of every source available to us. The most important source is our readers.

You can help by sending to us the names, titles or jobs of the men in your company who are key men in a plastics department or activity or of the men who are studying or planning for the setting up of such a department. This would include designing and building of molds of all types, fabricating of plastics materials and the contract manufacture or production-for-direct-sale of plastics products.

As an appreciation of this courtesy we will be glad to send to one man in each organization who sends us this information a copy of "Brief Survey of Plastics", a 36-page reprint of the initial five articles of the Prince series on "Procedures in Plastics."

Tear out and mail to the Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, O. Use letterhead if space is insufficient.

Name .....
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Name .....
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We have (do not have) a Plastics Department .....
Types of work done.....
Send a copy of "Brief Survey of Plastics" to:
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The WIGGLER has had its day!

Now CENTER-SCOPE Gets the Play!

There was a time when the wiggler was considered "tops" for positioning a machine tool spindle. BUT, THAT'S NOT TRUE ANY MORE.

The Center Scope is now the fastest method for accurate centering of a machine tool spindle. It has a trimming screw to compensate for spindle run-out, which European-made microscopes do not have. 45X magnification makes it easy to work to tenths.

As a top-flight mechanic, you should own a Center Scope — or, if you feel that the boss should buy one, *put the bee on him.*

Center Scope with Illuminator and Eye Shield.....$97.00
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Edge Block for use with Center Scope $23.00

For complete details, write Dept. CS (3)

Kearney & Trecker Products Corporation
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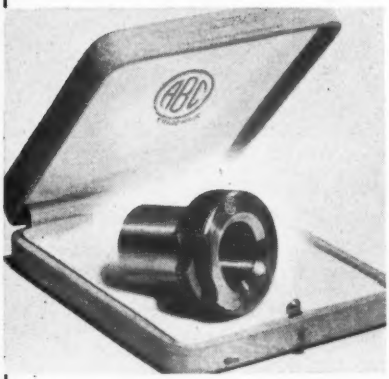

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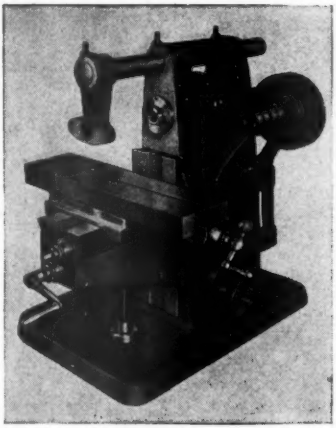

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Positive, true punch to-die alignment is assured at all times, thanks to the Lacey's sturdy, open construction. And punches can be removed as often as needed without disturbing alignment once the die-shoe is clamped to the table and punch holder fixed in position in the ram. No pry bar or hammer is needed to separate punches.

The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

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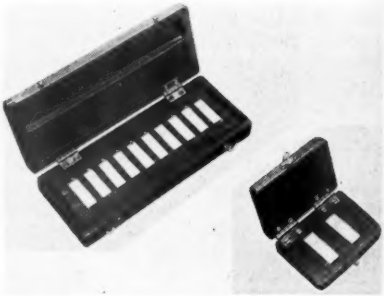
New Carbide Gage Blocks for which exceptional accuracy over a longer period of time is claimed are offered in sets by The Jansson Gage Company, Dept. T, 19208 Glendale Ave., Detroit 23, Mich. Made of tough, wear-resistant tungsten carbide the blocks are said to



hold to extremely close limits, often well within claimed tolerances.

Another advantage claimed for Jansson Carbide Gage Blocks is the remarkable ease with which they wring to form combinations, an important factor in handling small sizes.

Three all-carbide sets are available, of ten, two and two blocks respectively, and one set of 81 steel blocks with two .050″ tungsten carbide wear blocks. The Jansson ten-block set ranges in size from .050″ to .0509″ in steps of .0001″. The two smaller sets are intended primarily to be used as wear blocks with steel gage blocks. One contains two .050″ blocks, the other two .100″ blocks.

All sets are packed in durable, attractive cases as illustrated. For further information on these and other items in the Jansson line of precision products address the company. **1-N**

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This concern has been producing oilstones and other abrasive specialties ever since 1823; then under the old Pike name; today under the brand Norton Abrasives.

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This famous "PUSH-OUT" type collet chuck insures GRIP, RIGIDITY, has AUTOMATIC ADJUSTMENT, and FULL POWER under all conditions. There are no fingers, cams or bearings to cause friction or heat. HALL'S COLLET CHUCKS give full spindle capacity or over.

Now available in two sizes

One inch maximum capacity . $ 95.00

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Order now, chucks and collets delivered from stock.

HALL MANUFACTURING COMPANY

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"MECHANICAL SPRINGS"

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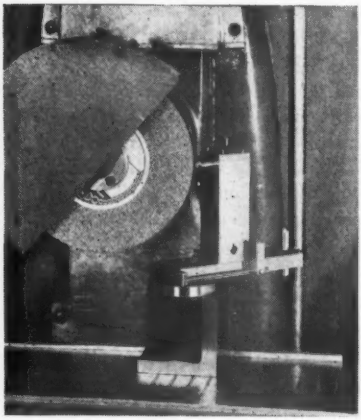
ANGLE AND RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. quality diamonds and instrument case included . . . $150.00.

It readily produces: Any desired angle; Convex radii to 4"; Concave radii to 7". On 7" wheel.

Specifications: Base 3"x 3", Height 8½"; Wheel capacity 10"; Angular travel 3".

For information or a demonstration CALL YOUR SUPPLIER.

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New Countersinking Machine

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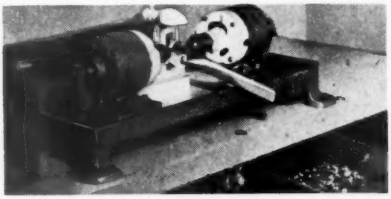
The Mercury Countersinking Machine is stripped of non-essentials. With mi-



cromatic tool post adjustment for depth and height, individual end micromatic adjustment for depth of countersinking, work rest of tungsten alloy heat-treated steel and equipped with No. 8½ Jacobs Super Chucks, the new unit is claimed to increase production more than 100 percent and save more than 40 percent labor costs.

The direct-connected motors (less than 1/6 hp) take 1/5 the usual power consumption and the compactness of the complete unit is such that approximately only 1/6 the usual bench space is required. Control equipment is optional, either knee control or floor pedal being available. B4-N

New Patents of Tooling Interest

(for obtaining, see page 130)

MACHINE TOOL, No. 2,334,544.
CROSS-FEED FOR GRINDING MACHINES, No. 2,334,581.
DEVICE FOR POSITIONING AND FORMING APERTURES, No. 2,334,614.
CRANKSHAFT CHUCK, No. 2,334,639.
ABRASIVE TOOL, No. 2,334,642.
NUT TAPPING MACHINE, No. 2,336,478.
MOLDING EQUIPMENT, No. 2,336,578.
TORCH CUTTING MACHINE, No. 2,336,626.
PRESS, No. 2,336,637.
WHEEL DRESSING DEVICE, No. 2,336, 650.
APPARATUS FOR DIRECT, RAPID AND CONTINUOUS MELTING OF NON-FERROUS METALS, No. 2,336,657.
COMPARATOR, No. 2,336,695.
LEAD CHECKING FIXTURE, No. 2,336,747.
GRINDING WHEEL TRUING DEVICE, No. 2,336,758.
METAL SPRAY GUN, No. 2,340,903.
MACHINE TOOL, No. 2,340,912.
BURRING ATTACHMENT FOR DRILLS, No. 2,340,941.
DRAWBENCH GRIPPER CARRIAGE, No. 2,340,948.

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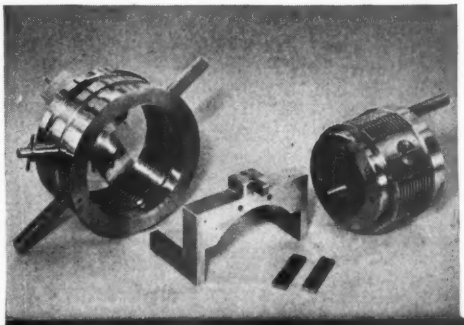

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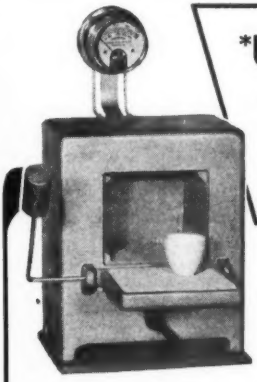

*Uniform Temperature Handy . . . Portable Fast Heating

● The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

***MUFFLE CHAMBER** has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. current consumption 1200 watt maximum. Heating chamber 4" wide, 3¾" high and deep. Outside dimensions 8¾"x 13½"x10". Shipping weight 30 lbs. **COMPLETE WITH PYROMETER (115 V.)**.....**$42.50**
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. . . OUR SURVEY SERVICE . . . guides you to the *Right* DIAMOND TOOL FOR THE JOB!

Through specific written recommendations this Golconda Survey Service assists you to maintain maximum operating efficiency from your tools.

It always gives you . . .

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This service is free—it involves no obligation on your part.

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It fully describes the Golconda Survey Service and contains valuable and useful information on diamonds and their uses in the tools of modern industry.

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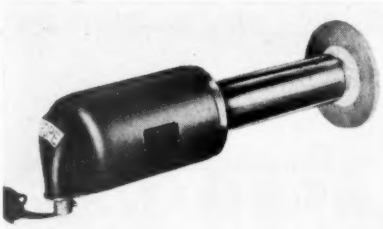
3422 N. KNOX AVE.
CHICAGO 41, ILL.

The DRAG ANGLE FINDER—A valuable instrument furnished our customers

Motorized Grinding Spindle

A new motorized grinding spindle for 6" x 18" grinders is announced by Pope Machinery Corporation, Dept. TD, Haverhill, Mass. The new Pope Spindle employs a G-E motor operating in a sealed housing; the lubricant is sealed in, good for the life of the bearings.

The accumulated oil, dirt and dust characteristic of fan cooled motorized spindles is eliminated. There are no



openings for air, lubrication or adjustment. The only attention required of the operator is to keep the smooth surface wiped clean.

Construction features assure production of exceptionally fine surface finishes. The specially designed motor delivers a full horsepower to speed up the grinding operation when surplus metal is encountered. The spindle is equipped with a large SKF Super-Precision Double-Row Roller Bearings and an extra heavy shaft. The spindle and motor are a complete sealed unit, without oil cups, grease fittings, wick or plugs of any sort.

The unit operates horizontally, vertically or at any desired angle. Special tool holders or standard drill checks can be mounted on the solid shaft extension. In addition to use on 6" x 18" surface grinders the Pope Spindle can be used on boring mills, planers, milling machines and other machine tools for special work.

Complete information may be obtained from the Pope Machinery Corp. 741-N

"An excellent job" is the comment of a nationally known mold shop operator on the new edition of Gordon B. Thayer's "Plastics Molds". This book, the first to treat its subject exclusively, is reviewed on page 216 of this issue.

Diamond
SELF-CENTERING VISE

DIMENSIONS

Overall Height.....4¼" Width of Jaws.....6"
Overall Width.....6¾" Depth of Jaws.....1⅜"
Overall Length.....7½" Maximum Opening....2"
Net wt. complete with 4 hold down bolts ⅜" diameter, approximately....36 lbs.
PRICE: F.O.B. FACTORY, $65.00

ACCURATELY centers and aligns work for milling, drilling, shaping, etc. Once tool is centered to jaws, work is automatically centered since both jaws operate simultaneously. Centering is unaffected by variations in stock thickness. Work is gripped evenly and tenaciously with parallel, serrated, hardened steel jaws. All castings special, high grade semi-steel, "beefed up" for extra rigidity and strength. Husky alloy steel screw hardened for long life.

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TOOL STEEL SIMPLIFIED
By FRANK R. PALMER
Vice-President of
The Carpenter Steel Company
315 *Pages* 205 *Illustrations*
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● **Widely used throughout industry and trade schools, "Tool Steel Simplified" meets the urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble shooting in the tool room. Tells in easy shop language how to select tool steel, how to make tools, how to improve tool performance. It is available *at cost*, $1.00 per copy, to tool steel users in the U. S. A.**

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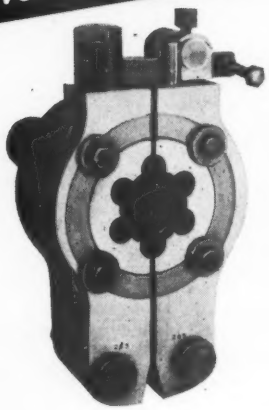

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Easy Cleaning

DIE HEADS

Automatically open at predetermined lengths of threads . . . Instantly withdraw from stock without reversing machine . . . Instantly set from *rough cut* to *finish cut* of thread . . . Button dies quickly changed . . . Less set-up time . . . Low cost.

Accurate speedy thread cutting is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment and makes this modern DIE HEAD the ideal general purpose thread cutting tool.

For tough threading jobs where constant uninterrupted operations are essential, use BHICO DIE HEADS.

No fussy adjustments to be made. Dies removed by loosening of two screws. When ordering BHICO DIE HEADS, specify DIE HEAD size and diameter of shank.

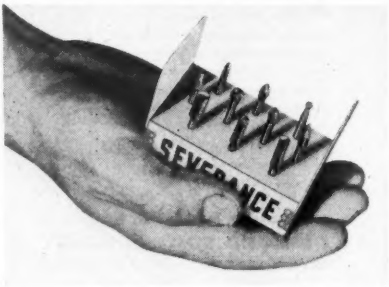
Ask your Dealer, or order direct.
Write for Details, Circular T-1

B-H INSTRUMENT CO.

3321-23 Avenue S - Brooklyn 10, N. Y.

Milling Cutters with 1/8" Shanks

Midget Milling Cutters with 1/8" shanks, designed for especially fine finishing of castings, patterns and parts, are announced by Severance Tool Industries, Inc., Saginaw, Mich. Hardened and ground from the solid, these efficient little tools have the same characteristics of the larger 1/4" shank tools



in the Severance line.

These tools cut sharp chips from the hardest metal, plastics or wood. Because of their small size, they are practical for finishing the most intricate patterns and parts and surfaces difficult to reach with larger tools. The 1/8" shank midget milling cutters have been furnished for a number of years on special order. This is the first time they have been available as standard stock items.

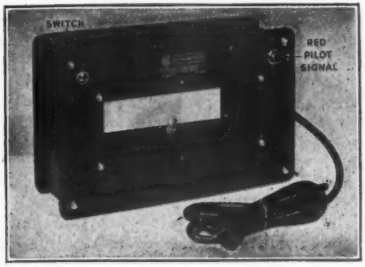
The new cutters are available in ten standard shapes, singly or in sets of ten in a convenient kitbox. **461-N**

"Molds for Sale"

You are not likely to find such a sign hanging from a tool room, die or mold shop door. A mold is an engineered product—its design requires specialized information. A knowledge of the plastics material, of the type and method of the molding process and of the use to which the end product is to be put are all requisites for successful mold designing. There is no royal road to good mold designing but, Gordon B. Thayer's "Plastics Molds"—Design-Construction-Use, is a sound approach to the basic principles of good mold design. See page 216.

AMC DEMAGNETIZER

A Tool Room Necessity



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Available for either 115 V. or 220 V.

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Enlargement shows actual impression made on a steel ring.

Acid or ink print your products in rapid succession by merely placing them on the table of this machine.

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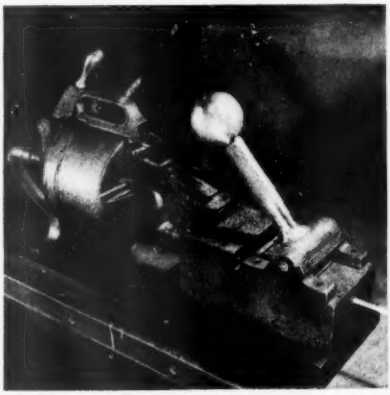
1303 S. Washington Ave., Minneapolis, Minn.

Machine for Beading Small Diameter Tubing

A tube beading device invented by Frank J. Nickel of The Glenn L. Martin Company has effectively solved small diameter tube beading problems where ¼" OD tubing is used extensively for hydraulic, fuel and instrument lines. Where conventional beading methods utilize tools by which the bead is rolled into the metal from the inside, the new Martin device produces the bead by squeezing.

The machine consists of a pneumatic squeezer with two sets of blocks cut out for ¼" tubing. One set of blocks is stationary and the other movable. In each set of blocks the ¼" hole is enlarged to a cup shape at one end. The tube to be beaded is clamped securely in place in the stationary blocks, with the end upon which the bead is to be raised extending out through the cup shape opening and into the movable blocks where it is likewise clamped. Both sets of blocks are actuated by a cam clamp. After the tubing has been clamped in place, a pneumatic cylinder pushes the movable blocks forward, compressing the tube which expands into the cup shaped recess to form the bead. The height of the bead is controlled by the movement of the cylinder arm and the size of the cutout in the blocks. The new method shortens the tube about ⅛" but this can be easily anticipated.



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It's Easier to Push than to Carry.

Load up to 20 tons on a PORTELVATOR . . . tools, materials, work in process, anything . . . save time, man-power and labor-cost.

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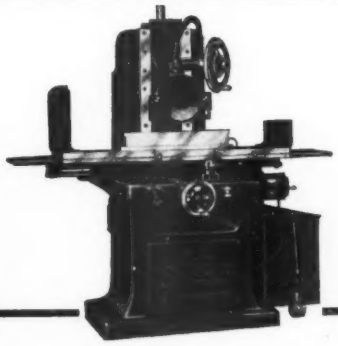

Grand Rapids Surface Grinders are the result of over thirty years actual experience in the building of precision grinding equipment . . . A patented vertical head adjustment is featured. When using the circular Vernier reading for extreme accuracy, the graduated circular plate can be set at zero in relation to the pointer extending inward from the rim of the large hand wheel. The pointer will travel in the same direction as the small inner hand wheel, but at ⅛th the speed . . . Attractive and amply illustrated Bulletin GL-100 is available.

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This is no time for machines to stand idle, while good tool makers rummage through the scrap heap for setting-up materials or waste vauable time fashioning makeshift setting-up devices. Equip all planers, shapers, milling machines, drill presses and special machines with ARMSTRONG SETTING-UP TOOLS—Planer Jacks, Bracing Jacks, "T"-Slot Bolts and Drop Forged Strap Clamps that reduce setting-up time to a minimum, hold work and jigs rigidly, prevent delays, accidents and spoilage and stand up for years.

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McGrath St. Paul precision instruments are outstanding examples of accuracy and fine workmanship. The engraving of the mechanically calibrated graduations (.0035" wide) is clean cut and easy to read. Only the finest aged high grade tool steel is used. the bases, scriber bars and working surfaces are hardened, ground and lapped to within 2½ millionths of an inch. Our height gages are tested and certified accurate by the country's leading gage laboratories.

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With merely a "twist of the wrist" you can now do the usual five *minute* job of true dressing of your grinding wheels . . . in five *seconds*. No need to disturb the work set-up to dress wheel as occasion demands.

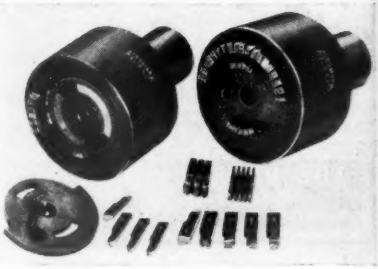
Jiffy

DIAMOND **WHEEL DRESSER**

is easily attached to standard surface grinder and becomes a part of the machine. Dresses absolutely true regardless of relative position of wheel to work table. Send for Bulletin 602J.

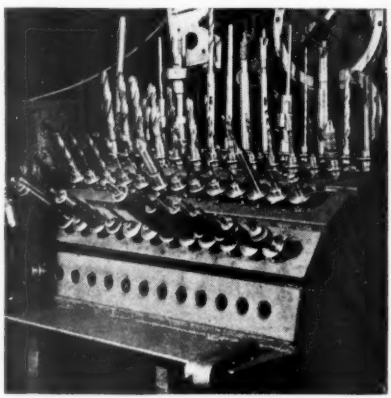
Made by Florian Mfg. Co., Plantsville, Conn.

Acromark Type Holder



The Interchangeable Stamping Type Holder illustrated, was one of a number originally designed to stamp ordnance parts which required several different character sizes on different radii. Each holder was individually engineered for the particular part being stamped. Since it was necessary to provide an arrangement so that the type could be readily changed, Acromark Heavy Duty Segment Style Type was used. Simplified construction permits changing of type in any line by removal of only one screw.

For full details and specifications, write to The Acromark Company, 5-15 Morrell Street, Elizabeth 4, N. J. 636-N



This drill holder provides quick selection of the proper drill for the job at General Electric's Schenectady Works. The several surfaces accommodate different size drills with enough space between for easy grasping.

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Makes possible better die, tool and pattern layouts . . . saves production time. Sample on request.

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FLEXIBLE SHAFTING
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ELLIOTT Flexible Shafting is sold in 25 to 28 ft. mill lengths and is easily fitted to all sizes and styles of equipment.

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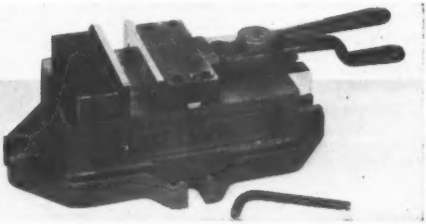

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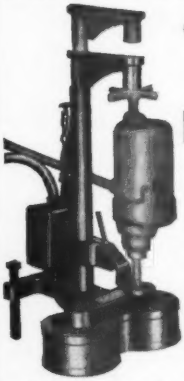

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A new line of general purpose "Junior" hydraulic presses, in both bench and base types, comprising three tonnage capacities, 1 ton, 2 ton and 4 ton has been developed as the result of the wide demand for the 1-ton Junior press previously available from Colonial. The new line, including the one ton, however represents a complete design and re-

styling and the operating characteristics are such as to provide a high degree of flexibility for general shop use or for conversion from one form of operation to another. Thus the presses may be used for assembly work, for push broaching or pull-broaching and may be converted from bench to pedestal types or vise versa.

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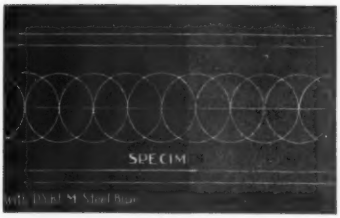

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Simply brush on, ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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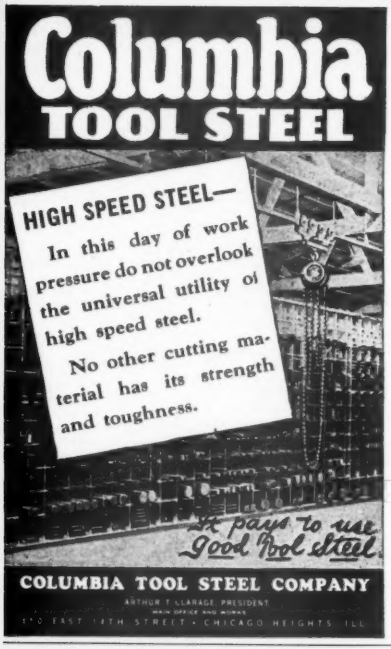
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TOOL STEEL
HIGH SPEED STEEL—
In this day of work pressure do not overlook the universal utility of high speed steel.
No other cutting material has its strength and toughness.
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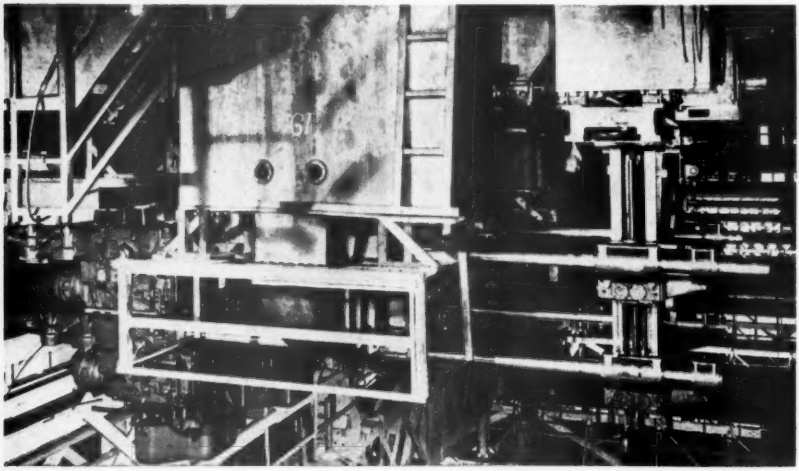
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge and Single Set. Diamonds for all Industrial Purposes.



It now takes three days instead of three weeks to bore and face five gear-center bearing holes for the reduction-gear case of 8500-hp C-3 turbines at the Joshua Hendy Iron Works, Sunnyvale, California. This was achieved by adding two spindles to a three-spindle Giddings & Lewis mill, enabling all operations to be performed simultaneously. Machine is kept permanently adjusted for the job, eliminating the need for new setups with each case. Tolerances for all measurements must be under 0.003".

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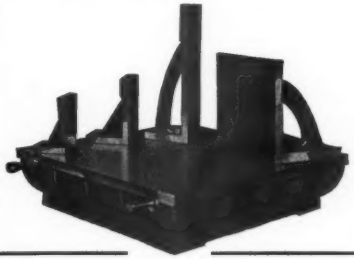

A full line of surface plates, angles and box parallels. Standard plate sizes from 8″x 8″ to 48″x 96″, larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

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PREFERRED BY EXPERTS
COMTORPLUG

Precision Internal Gaging to fractions of .0001″

Sizes: ¼″ to 7″ diameter and larger

The precision of Comtorplug is independent of errors of human variation. With positive accuracy, it analyzes bores for size, front or back taper, out-of-round, bell mouth, etc., to fractions of .0001″. Used at machine as well as by inspectors, it speeds and improves production of precision holes.

REQUEST BULLETIN 29

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"ROCKWELL"
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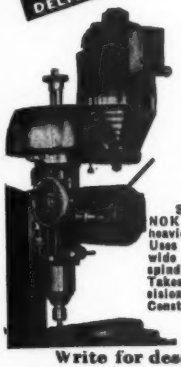

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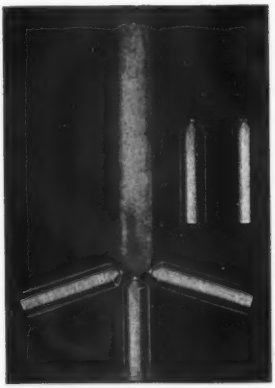

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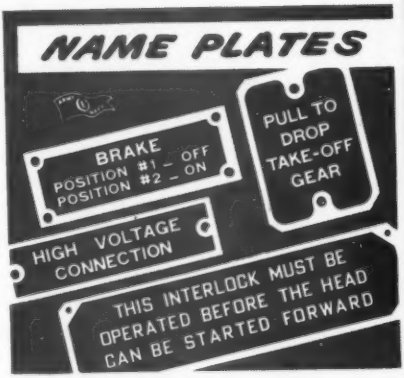
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"Plastics Molds"

The new edition of Gordon B. Thayer's book "Plastics Molds", Design-Construction-Use, is being very well received by the leaders in the industry and by the technical editors to whom early press run copies were sent. The unsolicited comments agree that the second edition is a very considerable improvement on the first edition, that the book is very timely and is as one well known executive wrote "an outstanding contribution on the part of mold design".

The book is much larger than the first edition in spite of the fact that the concise style of the first edition is carried throughout the new edition. The result has been that many more designs are included and much more practical usable information is offered to the designer as well as a fund of good tips for the student designer, mold shop operator or the tool and die shop man who wants to learn sound mold designing technique.

The 20 chapters, several of which were especially prepared by specialists, give the most complete treatment of the design and construction of plastics molds now in print. Features new to the edition are chapters on "Finishing Methods and Equipment", "Loading the Injection Mold", "Direct" and "Indirect Ejector Systems for Injection Molds", "Molding Screw Threads in Plastics" and "Practical Points in Mold Design and Construction".

The Nomenclature of Plastics Molding, which was widely quoted and used, has been enlarged. Many new definitions bring it up to date and increase its value to both the designer and the serious minded learner.

The illustrations are excellent and give many design hints which can be utilized in other designs. "Plastics Molds" should fill a real need, particularly among the mold shop operators who want to get ahead and among tool room and die shop craftsmen whose shops are making a steadily increasing number of the molds for all types of plastics materials.

"Plastics Molds" is one of the books every designer will find constant use for. It is a real buy at $3.50 postpaid. It is published by American Industrial Publishers, 310 Fairmount-Cedar Bldg., Cleveland 6, Ohio.

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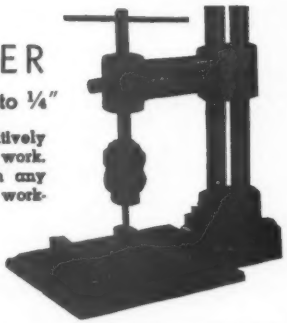

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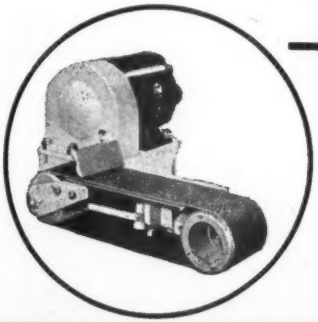

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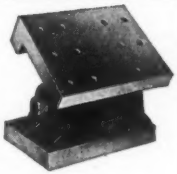
McMahon Adjustable Angle Plates



Model "A" Adjustable Angle Plate with four ⅜" "T" Slots. Size, 3" x3"x3¾". *Price*, $14.40. Shipping weight, 5 lbs.

Model "D" Adjustable Angle Plate with 16, ⅜"x16 threads tapped holes. Size, 6" x 6" x 7½". *Price*, $42.00. - - - - Shipping weight, 45 lbs.

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Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 0 to 4 inch.

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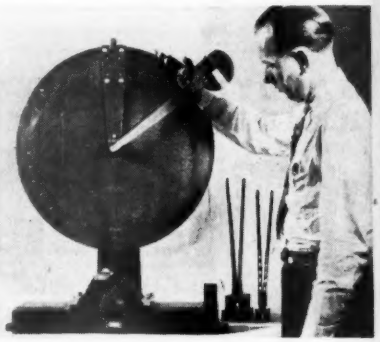
TESTING MACHINES FOR PLASTICS

The "Plastiversal", a new universal testing machine for plastics materials, is announced by Tinius Olsen Testing Machine Co., Dept. D, 500 N. 12th St., Philadelphia 23, Pa. The latest type machine can be used for tension, compression and flexure tests. Precision tests can be made in tension or flexure on film, sheet or molded specimens and thick plates, blocks or other objects can be tested to heavy loads in flexure or compression.

The ample work clearance, long stroke, Plastiversal unique in the scope of its usefulness. Loading is by screw power with a guided cross head. Special pro- high or low testing speeds and two ranges of straining rates are some of the features that combine to make the



Below — Plastiversal testing machine for plastics. Can be used for testing tension, compression and flexure. The electronic high magnification rdcorded automatically plots characteristics on the stress-strain diagram as a curve.

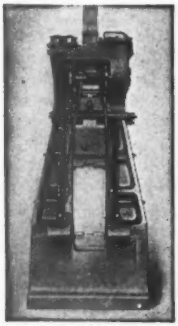
Right — The impact tester can be used for the Izod or Charpy type specimens.

BETTER Drop Forgings

from Model J-2 Chambersburg Board Drop Hammer

Forgings made on Chambersburg Model J-2 Hammer can be made to closer tolerances, are more uniform in quality and can be produced in greater quantities per hour.

The motor driven head is the acme of simplicity and quietness. The clean, well-proportioned lines of the hammer as shown in the illustration are indicative of the heavy, well-balanced anvil and frames.



Rear View

Further details are described in Bulletin 252-2.

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visions are made for eliminating all backlash and vibration. For tension testing capacity three ranges to 500, 2,000 and 10,000 pounds by .5, 2 and 10 pound divisions respectively, and for compression testing, two ranges to 10,000 and 50,000 pounds by 10 and 50 pound divisions respectively, are provided. A dual weighting system with separate levers for tension and compression loads, insures accuracy and sensitivity throughout the loading ranges. Both levers terminate in the same pendulum head of simplified and improved design.

Standard equipment includes one set of tension specimen holders and an 8-inch diameter compression plate permanently secured to the moving head.

Special equipment available includes the Olsen Electronic High Magnification Recorder (as illustrated), a specially designed extensometer which transmits the characteristics of the material under test by electronic means to the recorder. This is the one instrument which assures research accuracy and production speed for testing and recording all necessary facts in one stress-strain curve.

The Olsen Charpy and Izod Impact Tester was designed especially for testing the impact strength of molded insulated materials in accordance with the standards written by Committees D-9 and D-20, ASTM. It is now in use by many manufacturers and consumers of all types of plastics materials. The tester is made in capacities of 25, 50 and 100-inch pounds and is available with either the Charpy or Izod hammers, or both. Precision is combined with ruggedness of design and simplicity of construction to maintain adjustment under continuous service. The scale is calibrated with extreme care and is large for accuracy and ease of reading. Accuracy, corrected for friction and windage losses, is .01 ft lb. for values less than 1 ft lb. and within 1 percent for higher values of impact strength.

Bulletin No. 23 "Olsen Testing Machine for Plastics" gives complete information on the above testers, other testing equipment and tools for testing plastics. **B2-N**

Self-Sealing Sheeting

A new three-ply laminated plastics sheeting designed for pressurized high-altitude planes is announced by E. I. du Pont de Nemours & Co. The Lucite-Butacite clear laminate has a tendency to self-seal small holes due to the action of the rubber-like Butacite interlayer. The new sheeting resists shattering action when struck by bullets or shell fragments and is easily resealed by patches. Solid clear formed plastics usually shatter when hit in low temperature and under high pressure. The Lucite-Butacite sheeting will be a safeguard for planes operating at lower altitudes where such hazards as collisions with birds and the impact of ice thrown from the propeller are met.

Extruding Machines

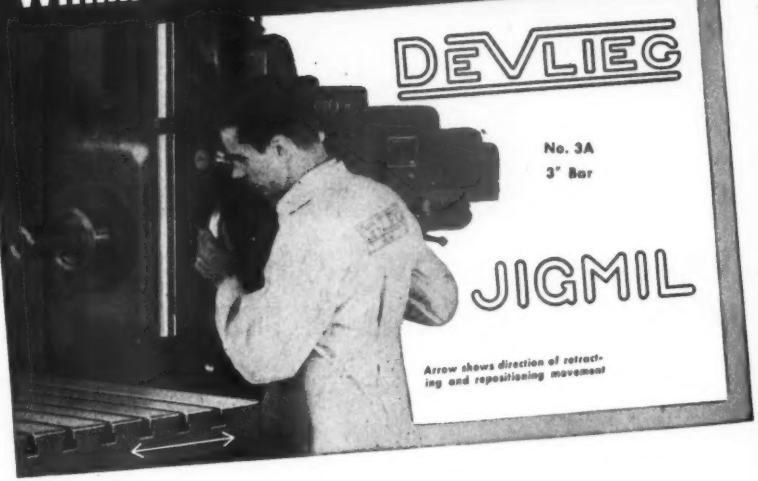
The features of the standard Royle Plastics Extruding Machine made by John Royle & Sons, 12 Essex St., Dept. TD, Paterson 3, N. J., are covered in Bulletin 424 issued by this company. A pioneer manufacturer of extrusion machines for rubber, the Royle machines are used for the continuous extrusion of resin compounds by the use of feed screws and die heads substantially the same as those long used for rubber.

The screw type extruder consists essentially of a cylinder through which a specially designed conveyor screw carries material fed into one end of the cylinder to and through a die at the opposite end. The screw thoroughly masticates, mixes and compresses the compound and the product emerges in continuous lengths, the form of the die determining the shape of the product. Royle cylinders are step-cored for positive circulation of steam, water or other media used for temperature control. The Royle Resin head, a die supported member where the plastics material is forced through the forming die, has adequate passages for the circulation of hot oil. The die holder is cored to allow temperature control at the very mouth of the die.

The machine is used to make rods, tubes and channels; to insulate wire and to cover hose and rollers.

More complete design data on the standard Royle extruding, tubing and straining machines is contained in Bulletin 430. Either or both bulletins are available from the Royle Company on request. **B6-N**

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer — Performance Qualities of a Milling Machine — Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal — a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

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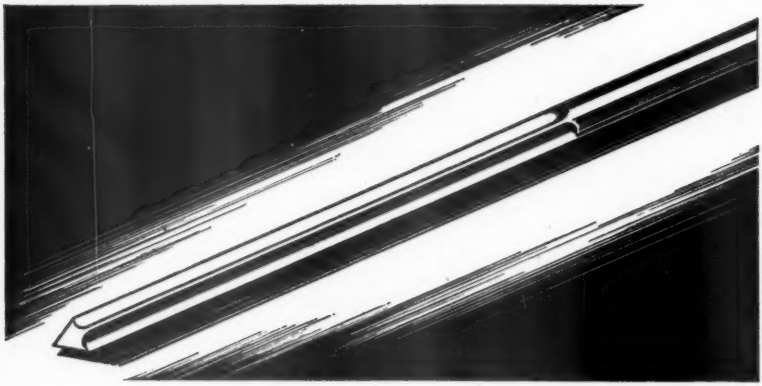

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We quote from *The Iron Age*, May 25, 1944:

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To achieve similar improved reamer production,
send us a trial order, or write for literature.

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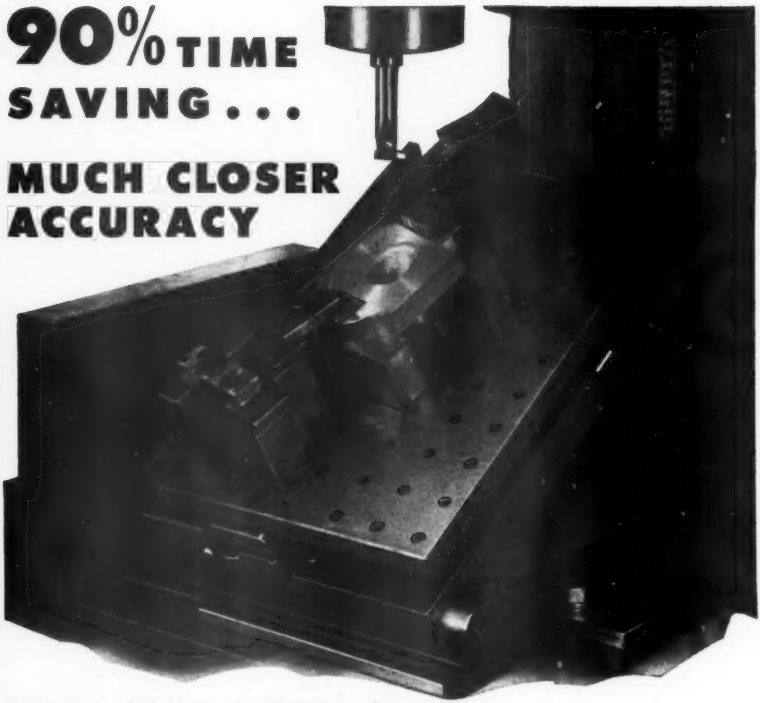

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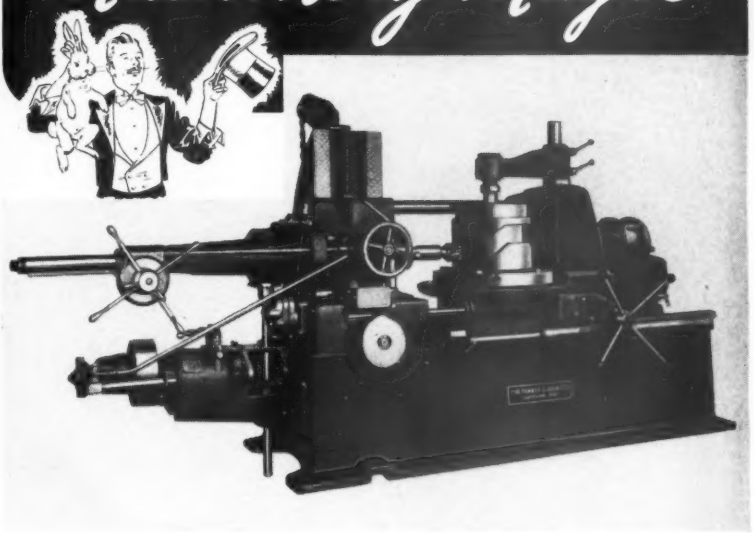

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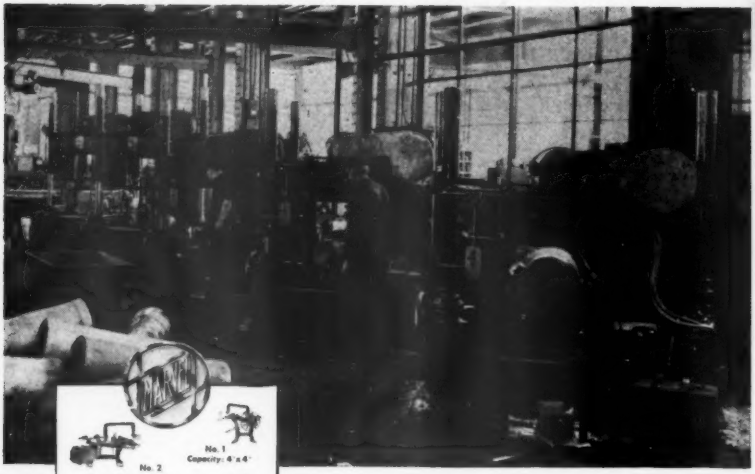

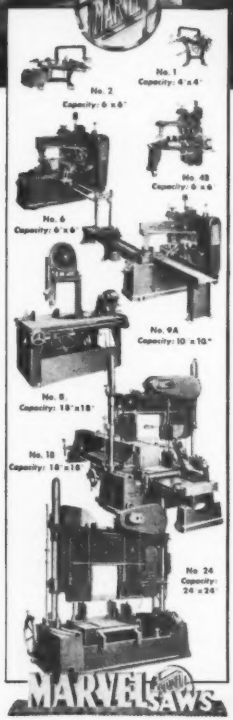

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